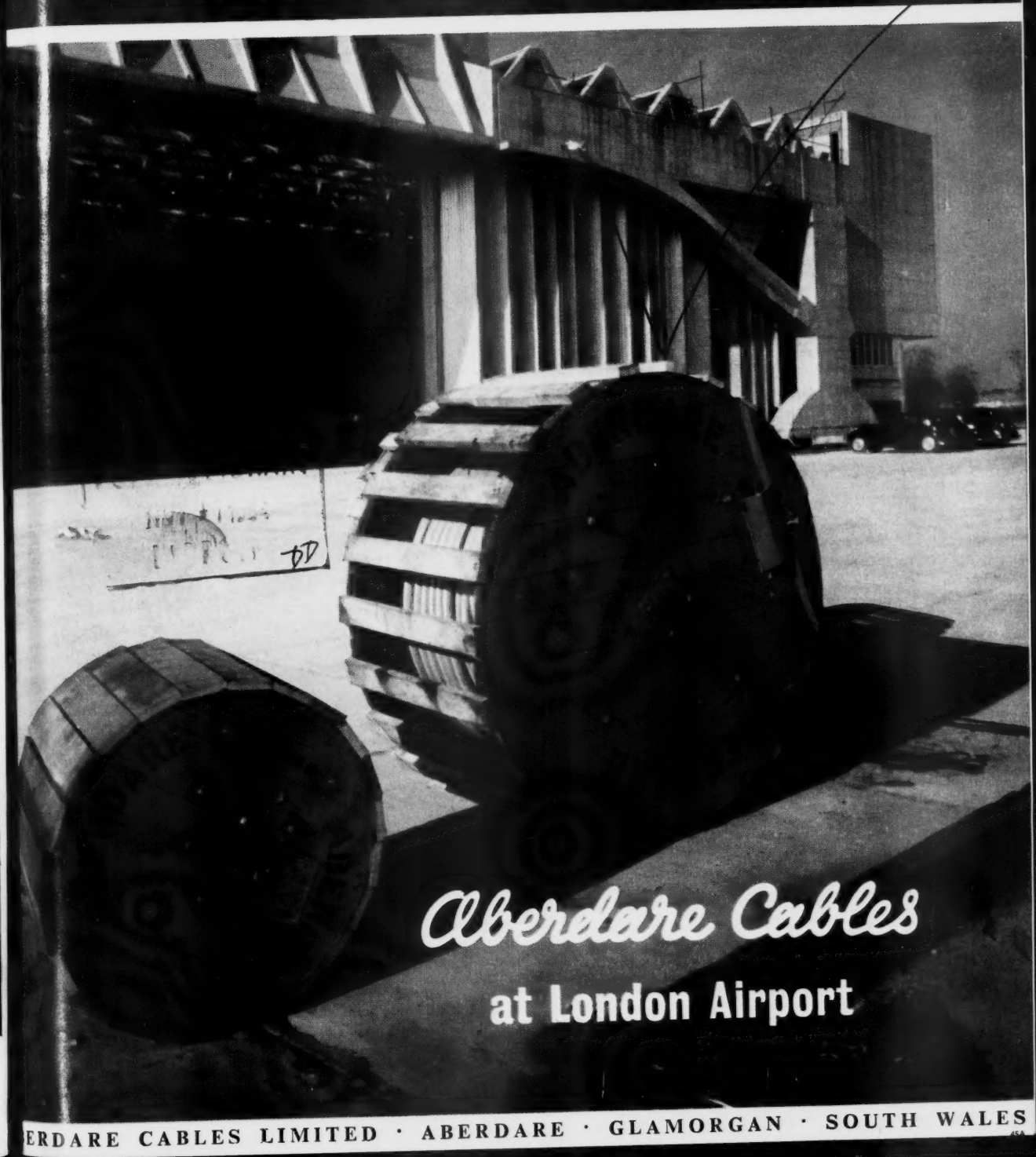
ELECTRICAL REVIEW



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SUPPLIERS OF ELECTRIC LAMPS THE EDISON SWAN ELECTRIC CO.LTD.

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THE EDISON SWAN ELECTRIC COMPANY LTD., 155 CHARING CROSS ROAD, LONDON, W.C.2

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Poppy Day

A remarkable photograph by Eric Hosking, F.R.P.S., of a newly hatched Avocet.

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An entirely new "Avo" Signal Generator has been developed and production will commence in the near future. The new instrument has a wide frequency coverage and has been specially designed to meet the requirements of the existing and proposed new Television and Frequency Modulation stations.

- Directly calibrated in frequency with a continuous band from 5 to 230 Mc/s over a scale length of approximately 60 inches.
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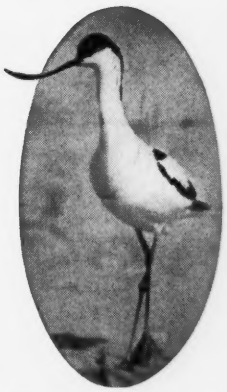
- The instrument is fitted with a comprehensive attenuator system.
- R.F. signal can be modulated from an external source.
- Internal modulation signals available for L.F. testing.

Fuller details and specification will be available shortly. Ask us to put your name on our mailing list.



The Avocet, a rare species of bird which has returned to breed in England after an absence of a century, has been adopted by us and has been registered as our Trade Mark.

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WANDLESIDE

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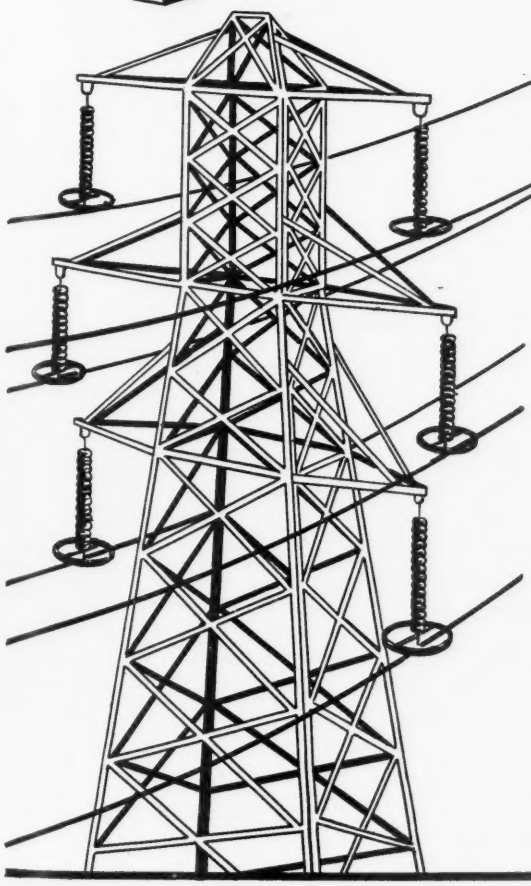

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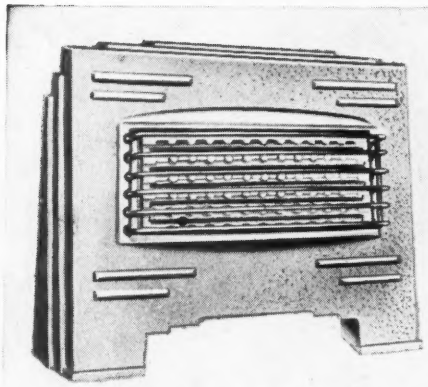
Be sure you carry ample stocks.



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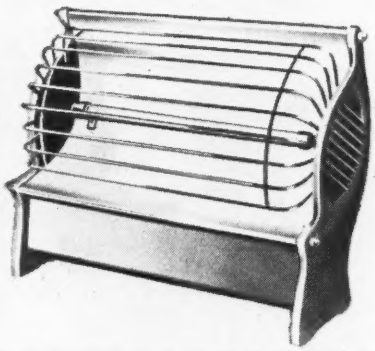
Simple well proportioned design and sturdy cast construction. In 1 & 2 kW.

REFLEX
A well-made fixed reflector fire of cast construction at a specially attractive price. In 1 & 2 kW.



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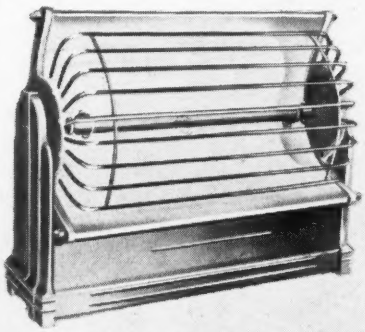
Keep in step with the growing popularity of convectors by giving a prominent place in your showroom to MEMVAIR convectors. Handsome, efficient and absolutely safe. Lovely bronze finish. In three ratings, 1, 1½ and 2kW with or without thermostat.



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Swivel reflector fire beautifully designed and built. Efficient reflector and guard. In 1 and 2 kW.

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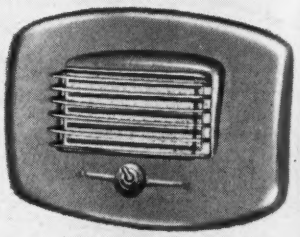
"Walbeam" Outset Flat Bar Pattern for surface mounting, and "Walray" Inset Reflector Pattern for recessing into wall or surround.



MEM fires are made in a choice of attractive colour finishes.

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Branches in London and Manchester. **All MEM Fires comply with BS.1670 & 1945**

THE SEVENTH 220-kV (1050-kV impulse level) TRANSFORMER

for the S.E.C. Victoria 220-kV Grid *leaves*

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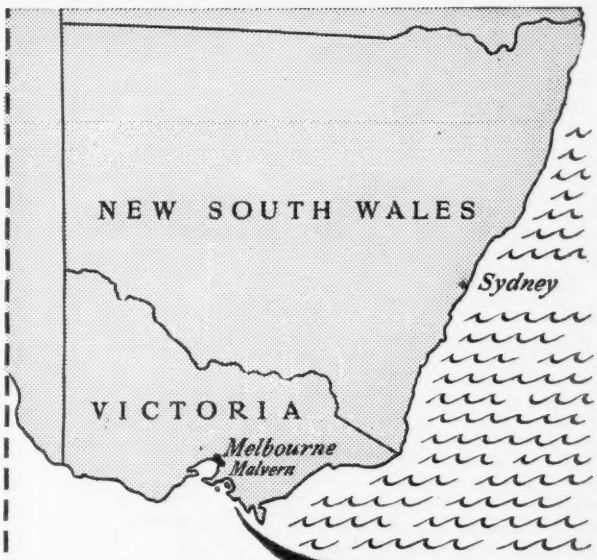
Rugby Works for

Malvern Substation (near Melbourne, Australia)



A further ten are being supplied to the State Electricity Commission of Victoria for the Brunswick Substation (also near Melbourne). Each transformer is rated at 15-MVA single-phase and forms part of a 45-MVA Bank.

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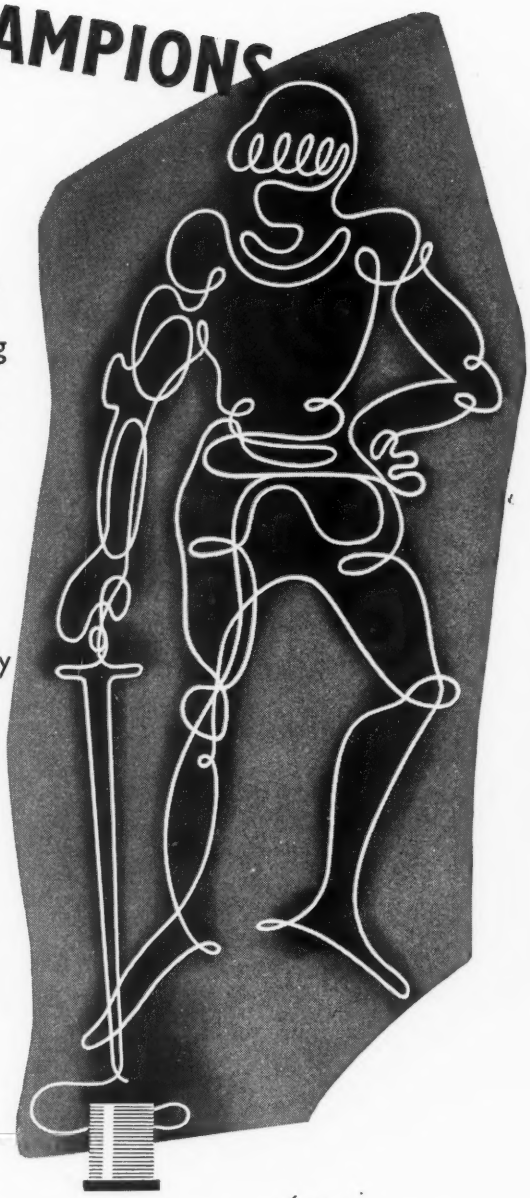

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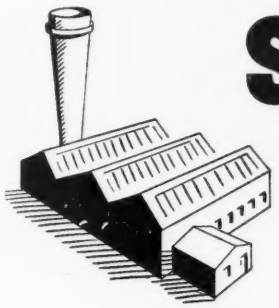
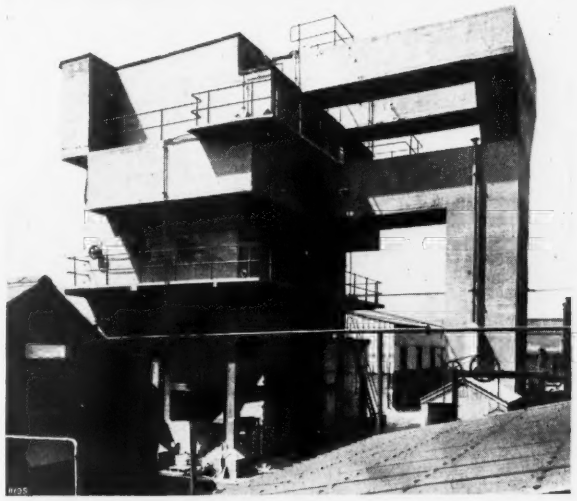
it can be recovered in a **STURTEVANT**

ELECTROSTATIC PRECIPITATOR



The many outstanding features in design and construction of Sturtevant Electrostatic Precipitators which contribute to their reliability and high efficiency are given in detail in our publication U.7007.



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VARIACS with DURATRAK

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VARIACS with DURATRAK have longer life, increased overload capacity and maximum economy in maintenance.

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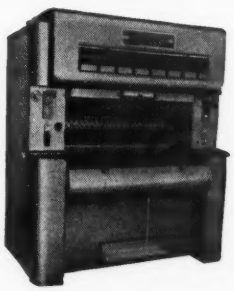

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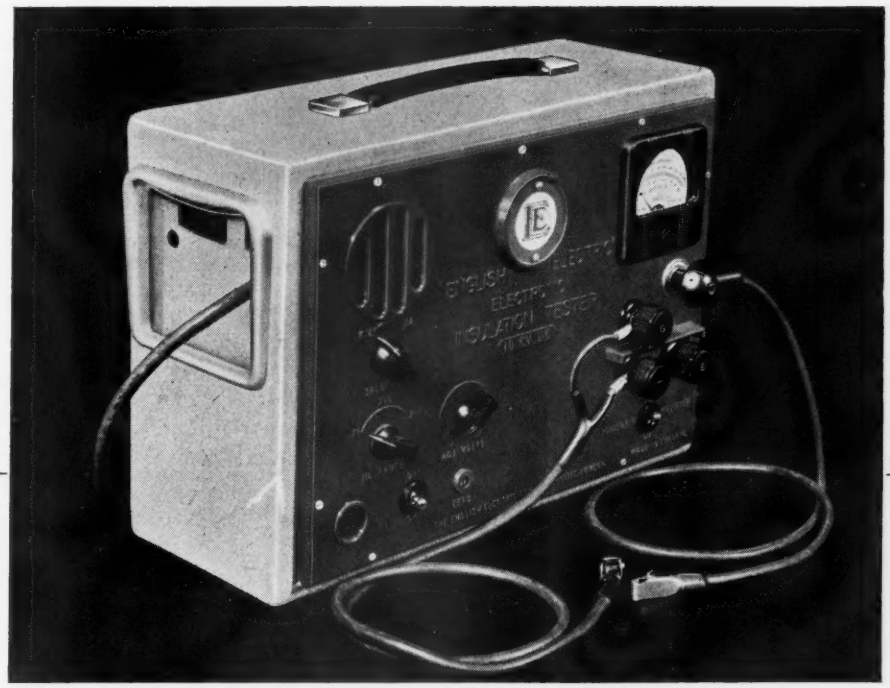

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- Rejection of surface leakage current.
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'ENGLISH ELECTRIC'

electronic insulation tester

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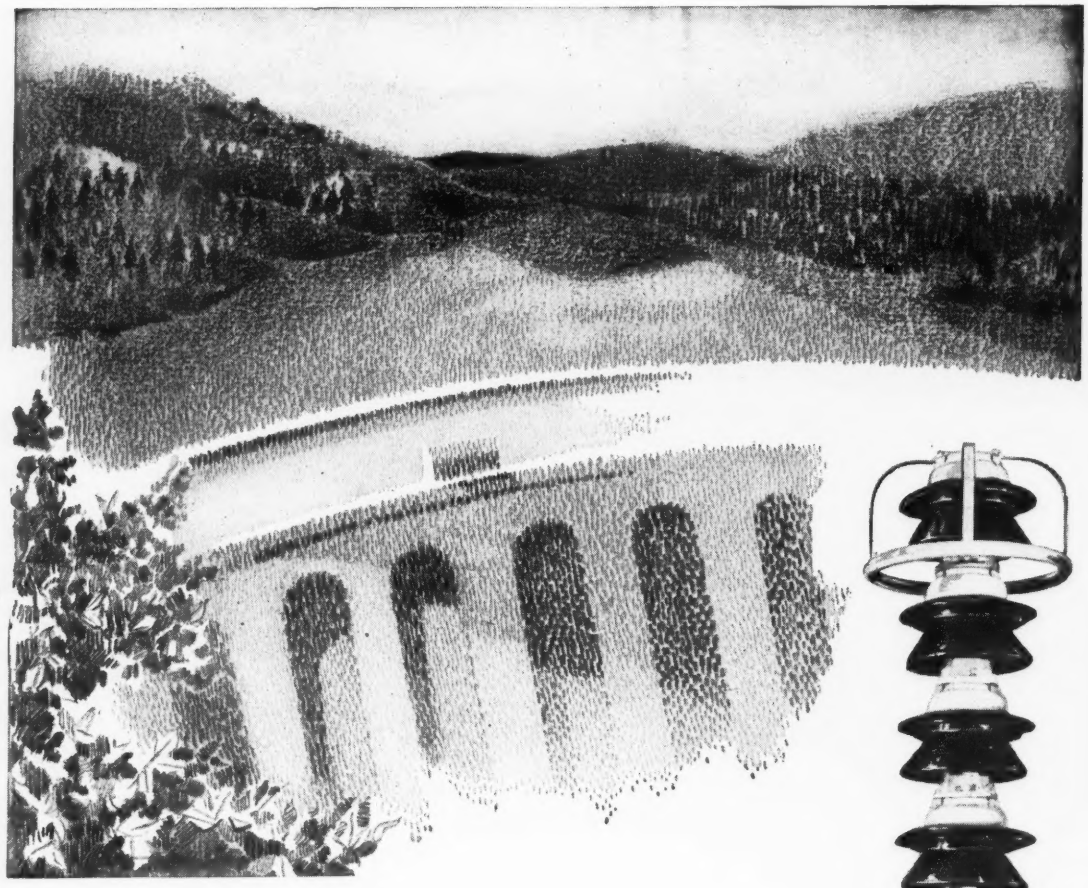

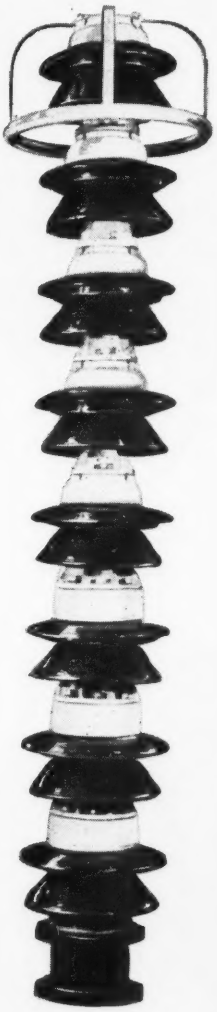

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The main erection bay with special impulse testing station in foreground.

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A view of the Ferranti Transformer Factory at Hollinwood.

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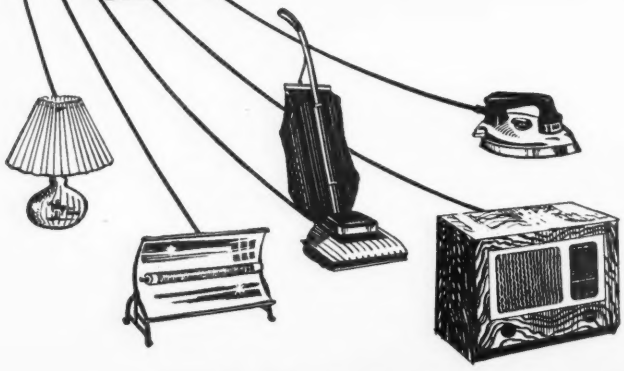
MADE IN ENGLAND
USE DEPENDABLE CABLES

ELECTRICAL WIRES & FLEXIBLES

Play Fair to- ELECTRICAL APPLIANCES



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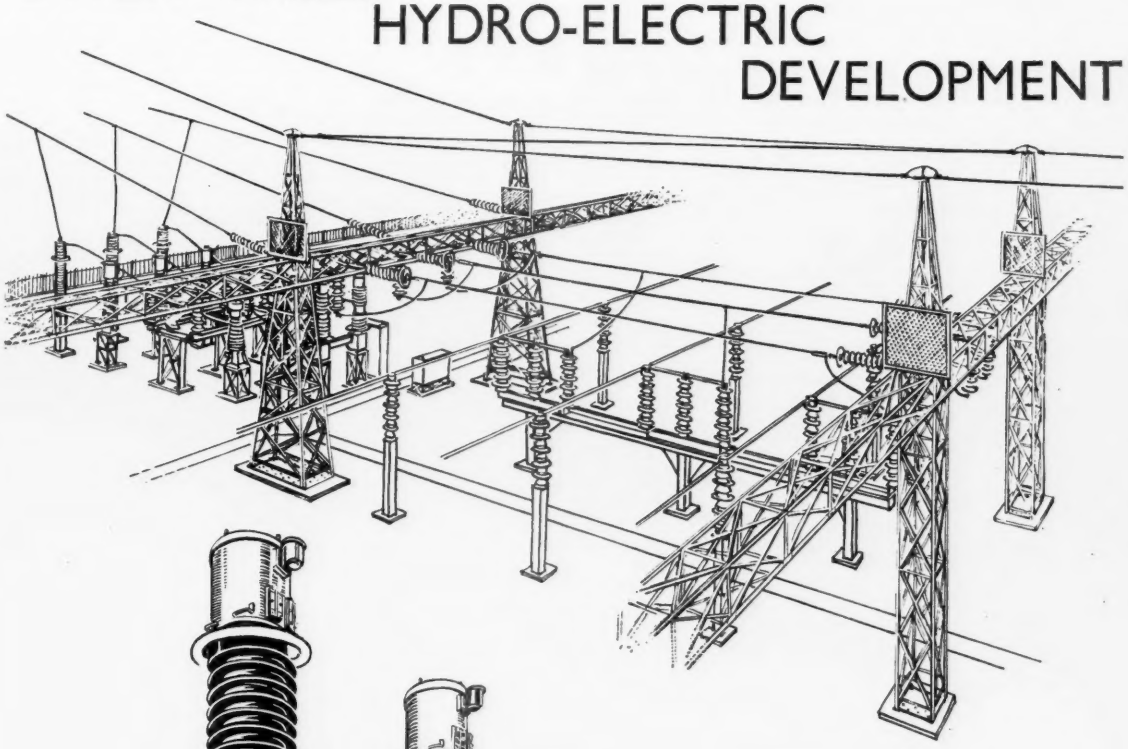
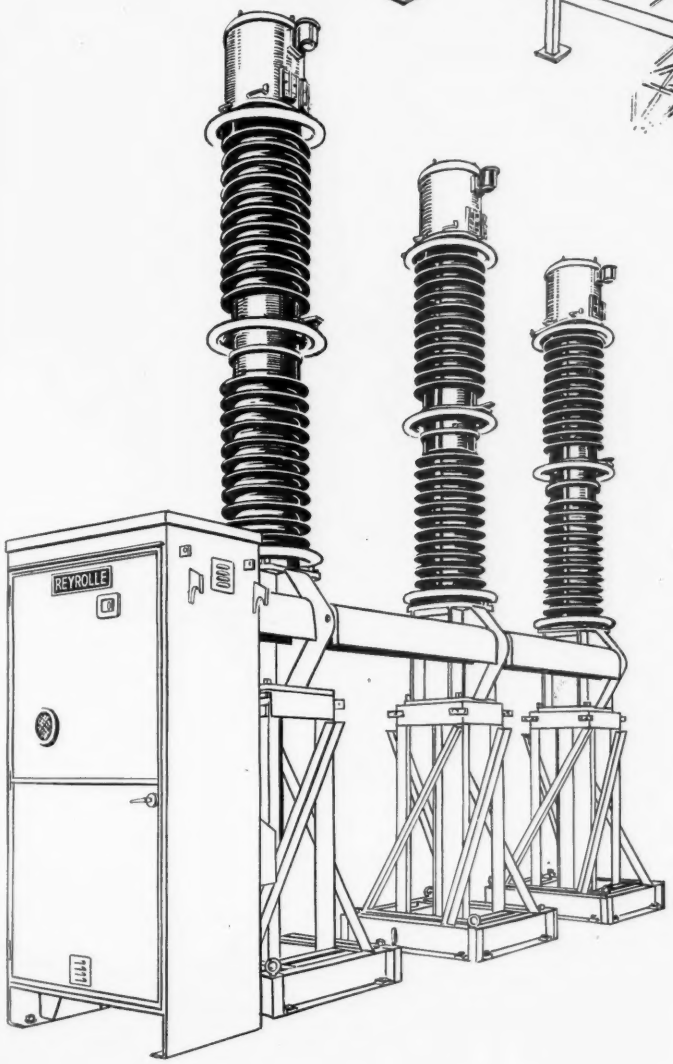


Owen Falls 132-kV Switchyard



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small-oil-volume
switchgear, having a
730-kV impulse-voltage
withstand, was
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on the equator
to meet conditions of
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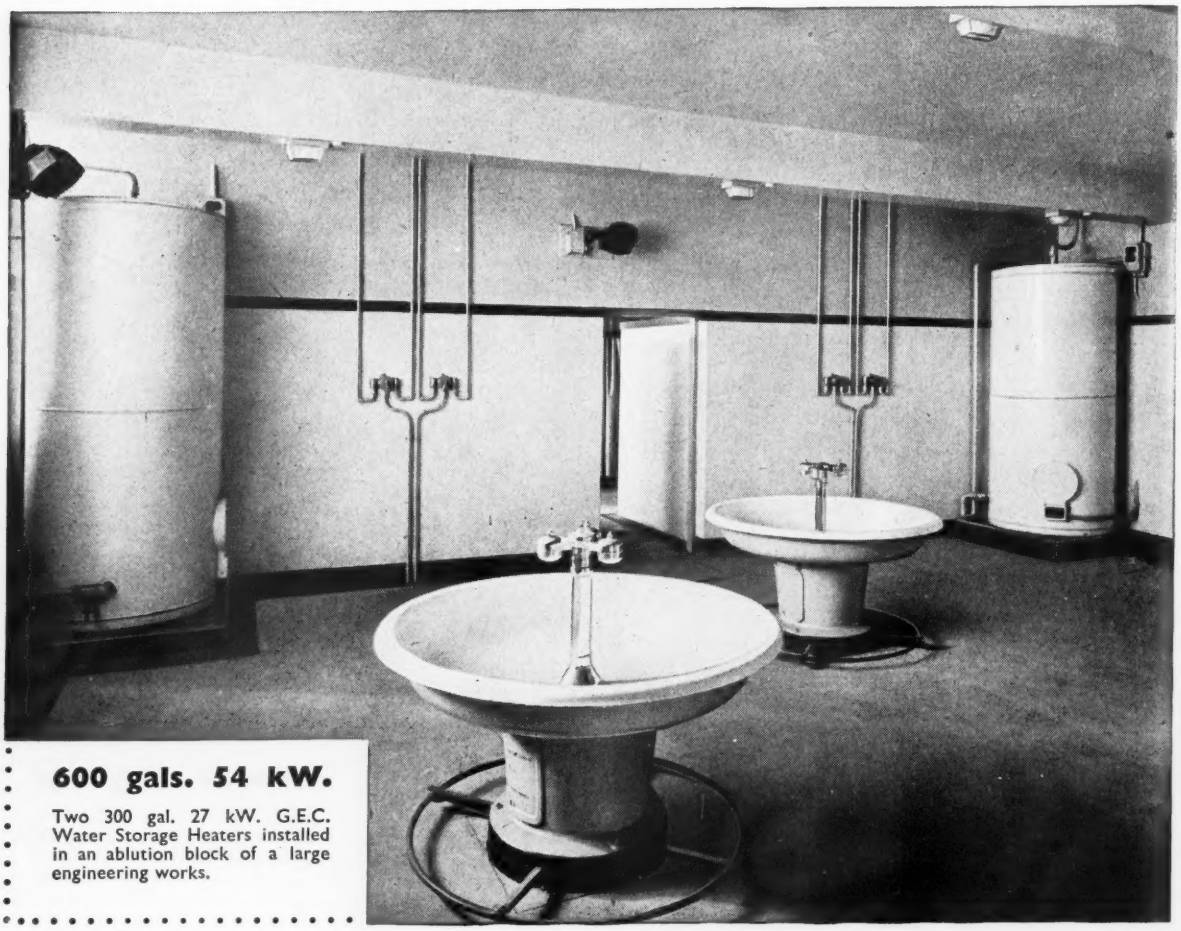
FOR EFFICIENCY AND RELIABILITY



600 gals. 54 kW.

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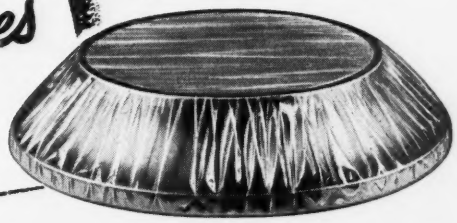

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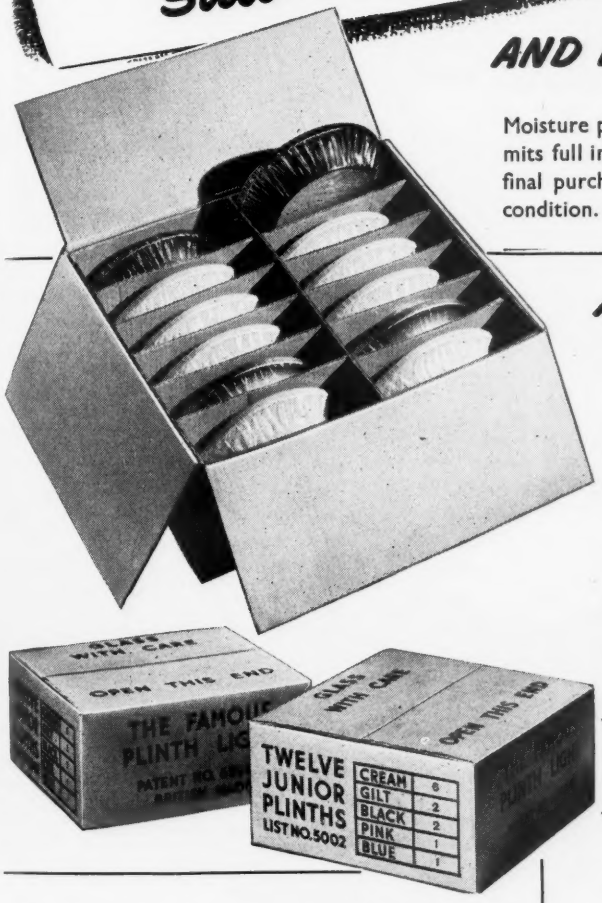

ALSO—THE PERFECT PACK!

Free Rail Certified Containers, holding 12 Plinths of a size, are now the standard method of dispatch. Each pack carries a schedule of colour content. When opened, the sealed transparent wrap gives immediate view of the colour assortment. An analysis of sales over the past four years, shows that the public demand, per dozen, is divided in the following proportion: 6 Pastel Cream, 2 Gilt Lustre, 2 Eggshell Black, 1 Pastel Rose and 1 Pastel Blue. This, therefore, is our standard colour selection—but, of course, any colour assortment can be supplied. Broken quantities carriage extra, plus part cost of packing.

Thousands of private purchasers write to us annually asking where they can buy a R.E.A.L. Plinth. As most Plinths are distributed by one or other of our authorised Wholesalers, we find these enquiries not only embarrassing, but expensive! R.E.A.L. is not a departmental store with a mail order section. We have done the spadework—WHY NOT JOIN WITH US IN REAPING THE HARVEST?

R.E.A.L. Plinth Light Patent No. 659876.

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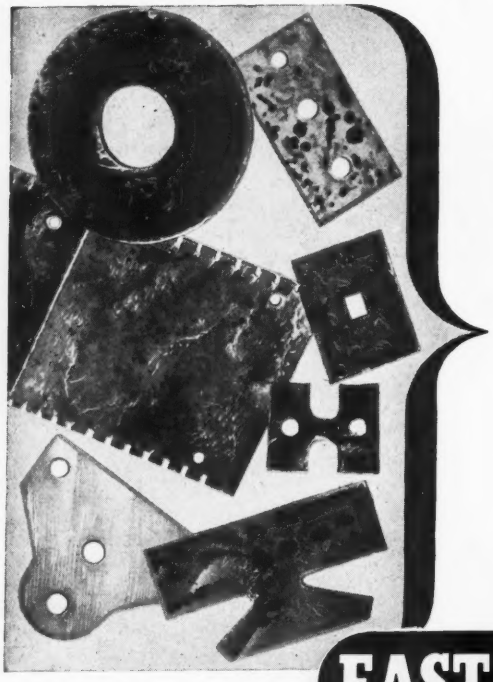

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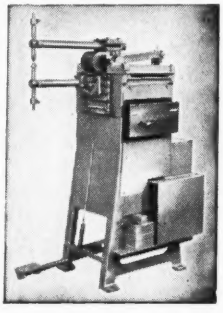
(Patent applied for)



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Immediate response to pedal but impossible to make incomplete weld cycle.

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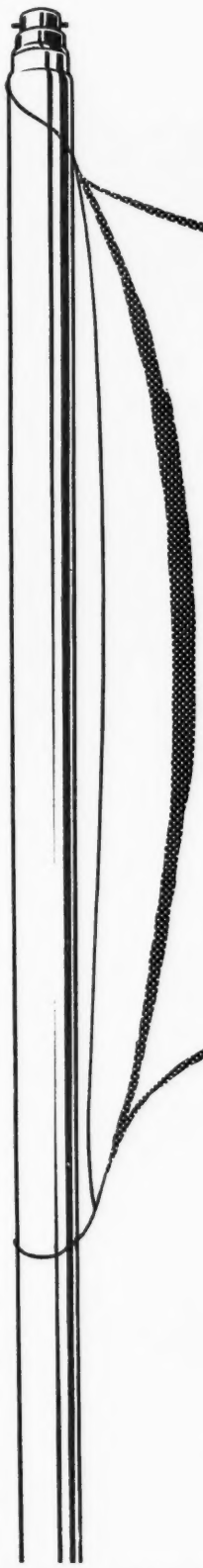

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COLOUR	SIZE	AVERAGE LIGHT OUTPUT DURING FIRST 5,000 HOURS OF LIFE (LUMENS)	
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DELUXE WARM WHITE	5 ft 80w	2,240	**2,560**
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NATURAL	5 ft 80w	2,720	**3,120**
	4 ft 40w	1,520	**1,640**
	3 ft 30w	1,020	**1,170**
	2 ft 40w	920	**1,080**
	2 ft 20w	580	**640**
	1½ ft 15w	390	**420**
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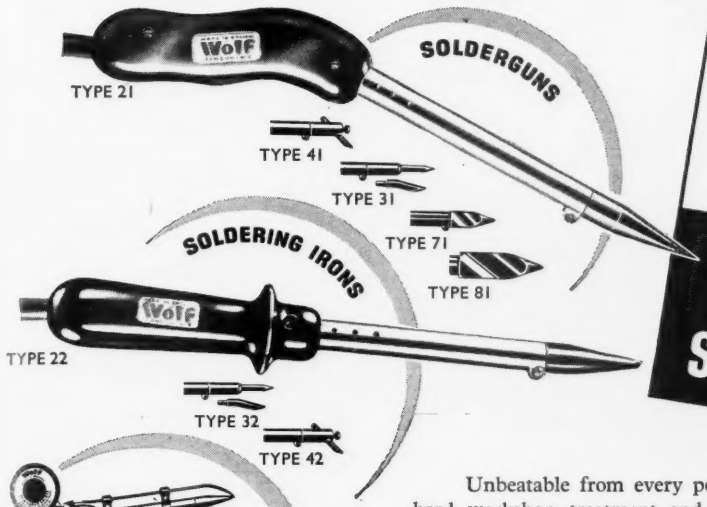

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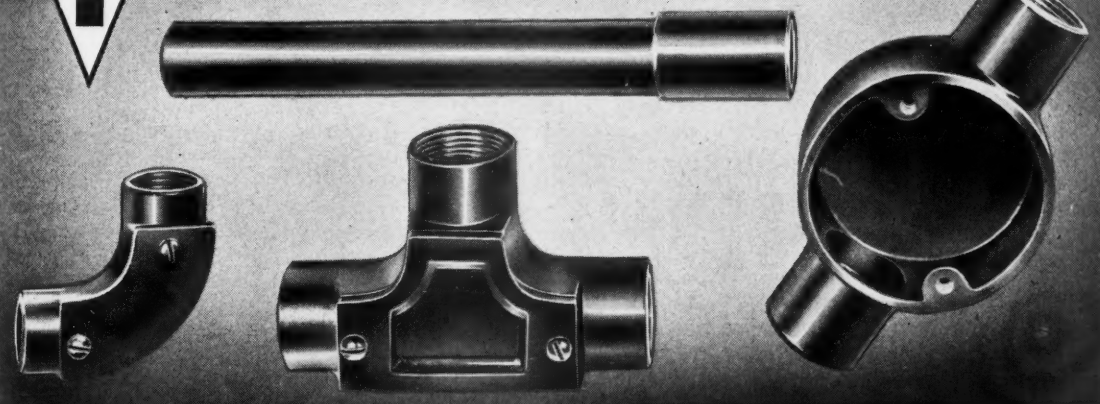

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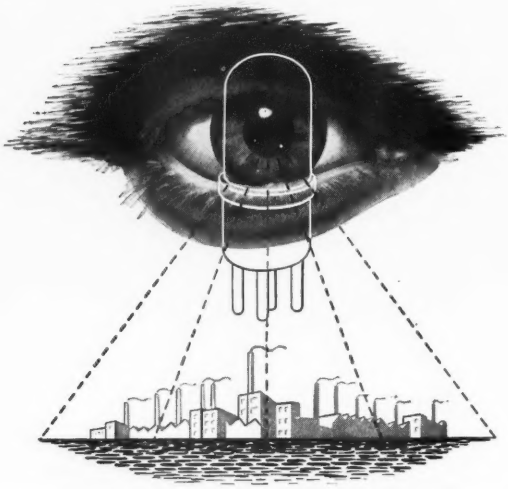

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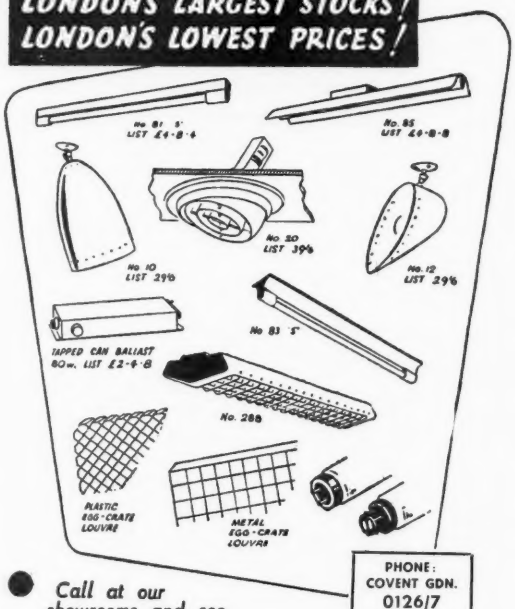

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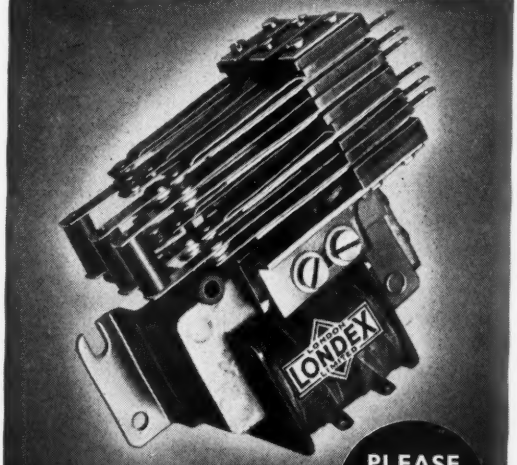

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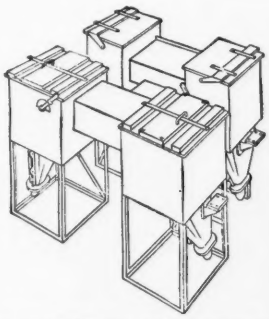
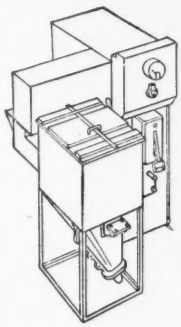
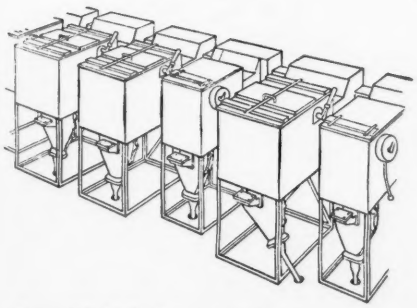


Non-extensible ring main arrangement

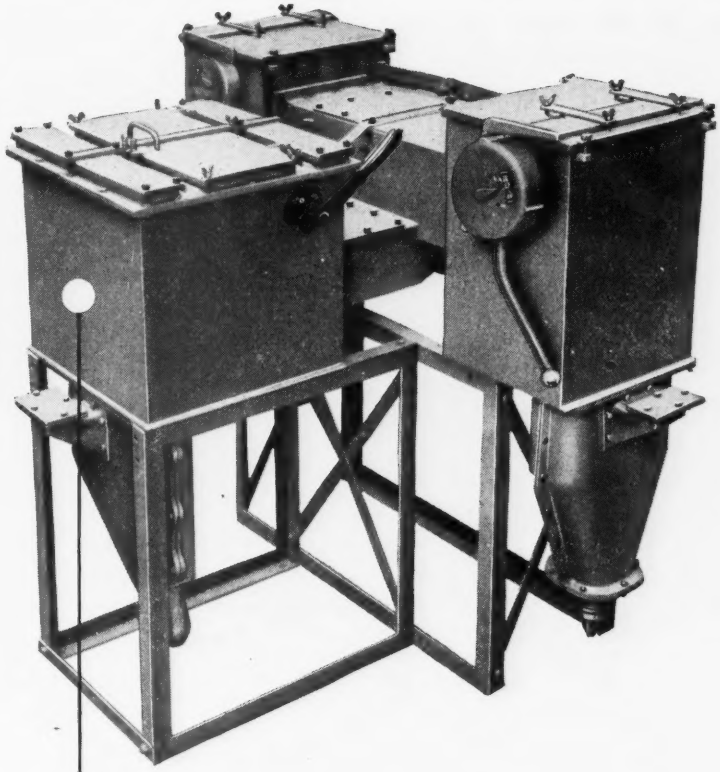


Combined 'OFS' and metalclad circuit-breaker unit



Extensible 'in-line' arrangement

Three of the many combined arrangements of the 'OFS' fuse-switch are shown above.



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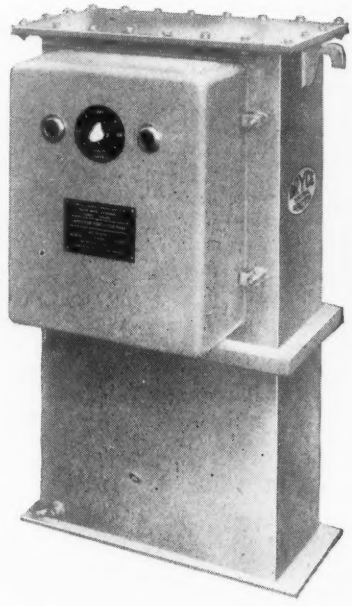

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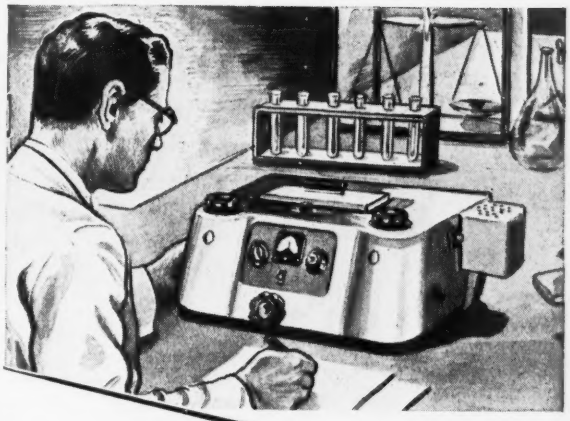

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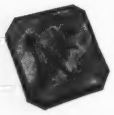

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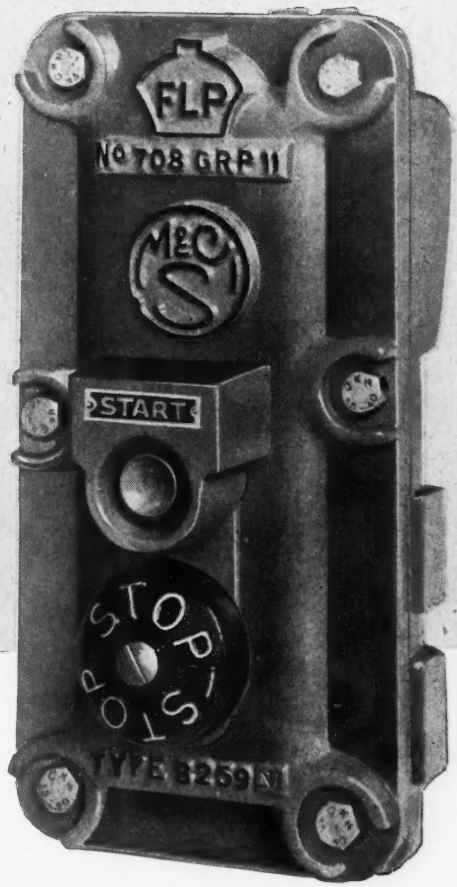

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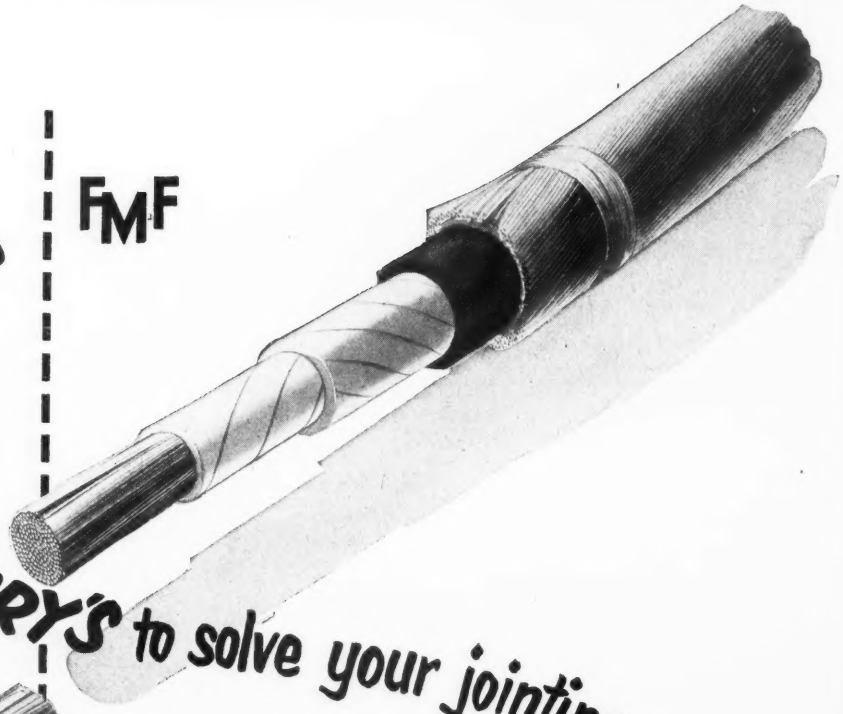

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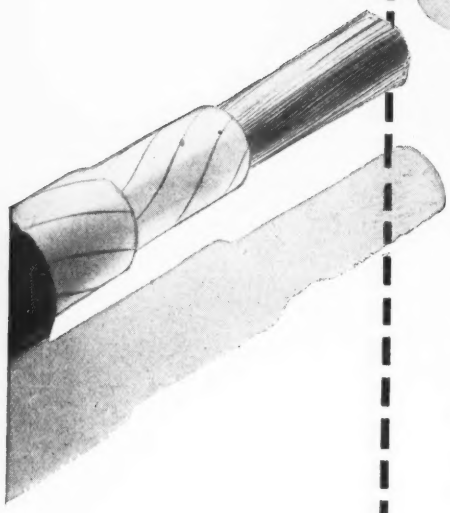

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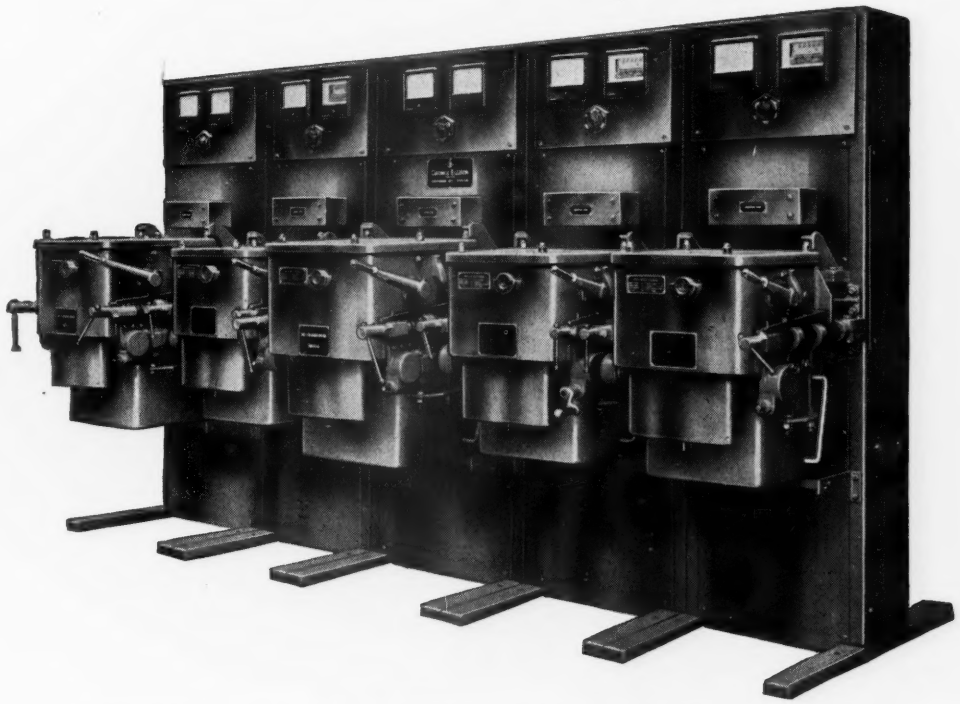

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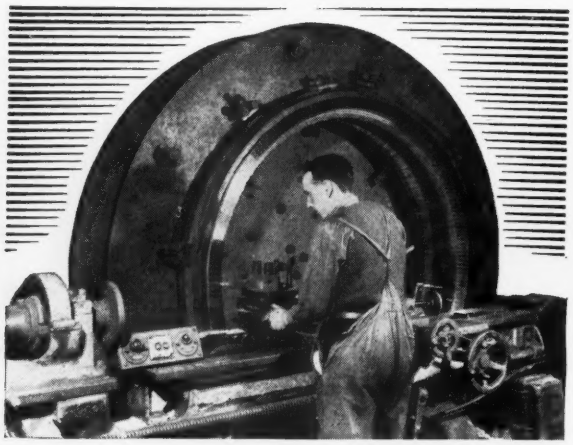

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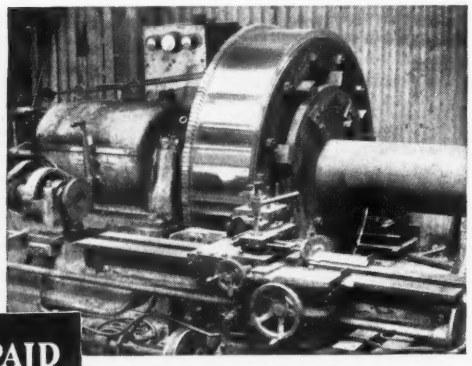

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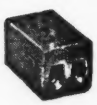

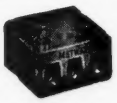

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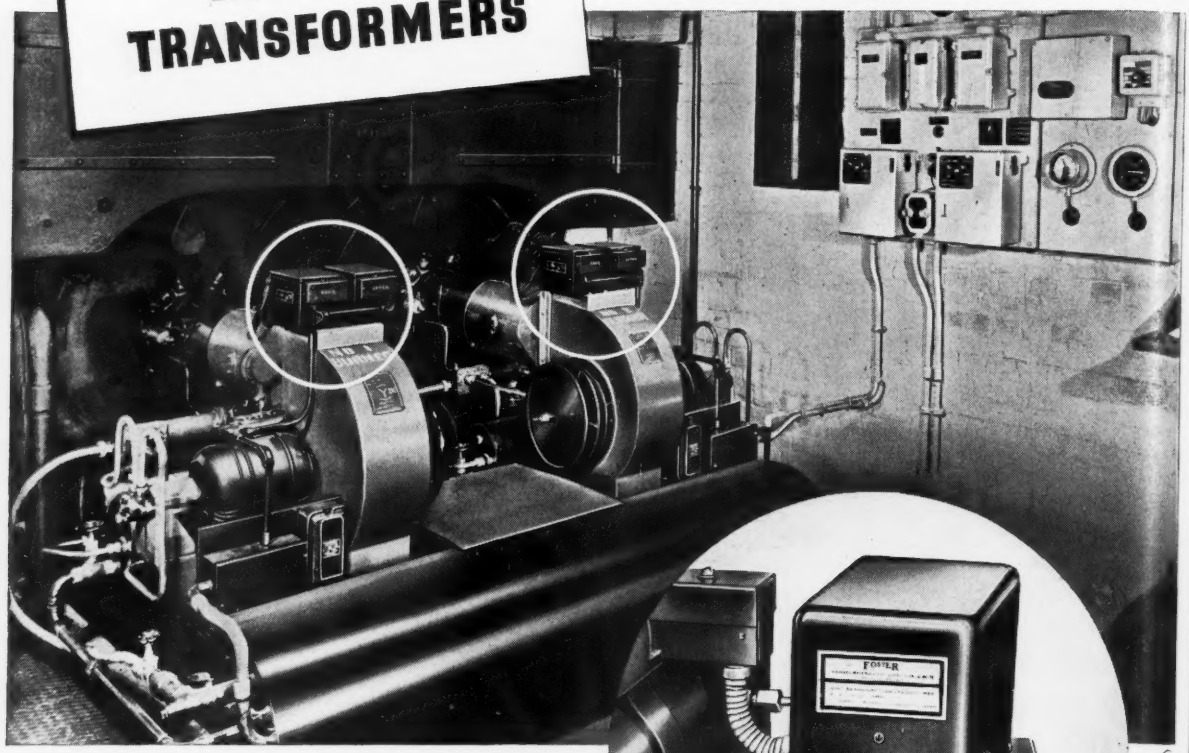

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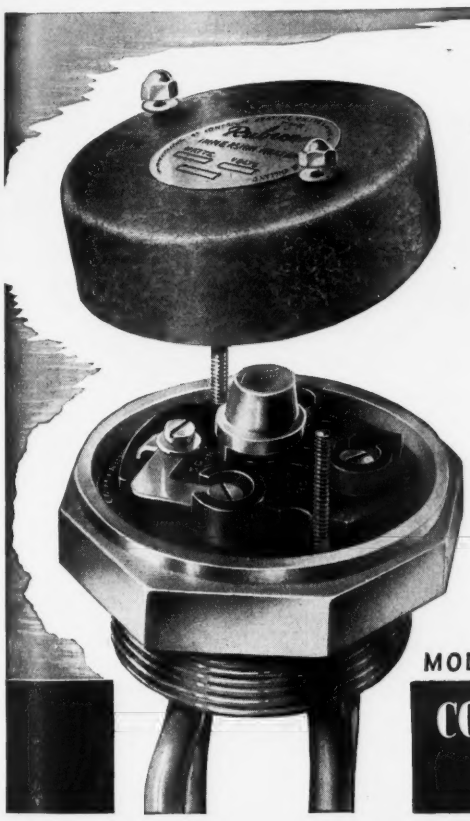

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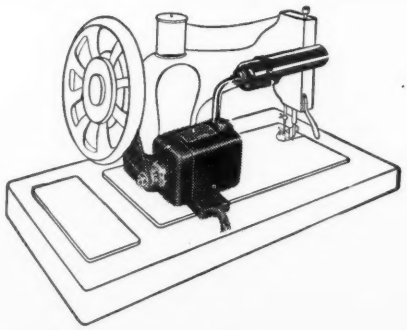

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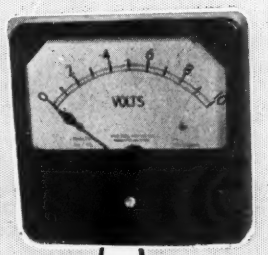
Shunts, up to 10,000 Amperes.
Transductors for measurement of heavy direct currents up to 15,000 Amperes.



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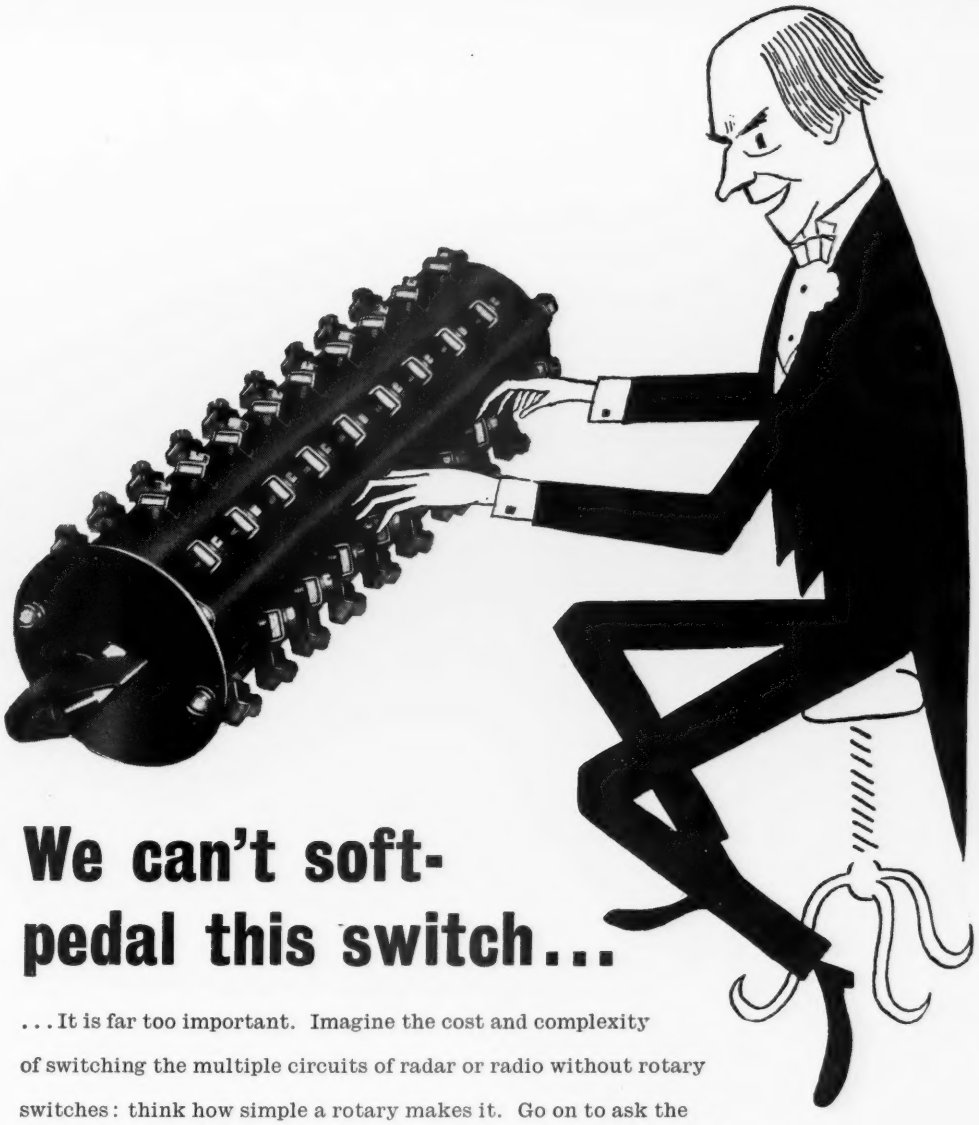

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...It is far too important. Imagine the cost and complexity of switching the multiple circuits of radar or radio without rotary switches: think how simple a rotary makes it. Go on to ask the obvious question: Why not the same simplification of industrial power switching? Why not indeed! Austinlite Rotaries are designed for that very purpose. They switch more compactly, more cheaply, more simply than conventional switchgear . . . and every switch is built for its job. Tell us what the circuits are: we will supply an Austinlite—no matter how special—to switch them. The switches are described in a technical brochure 'Simplified Switching'—copies are available on request.

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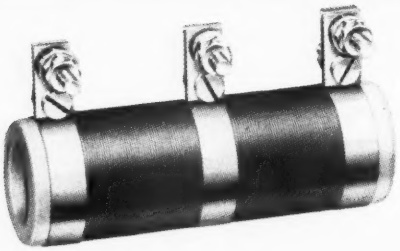

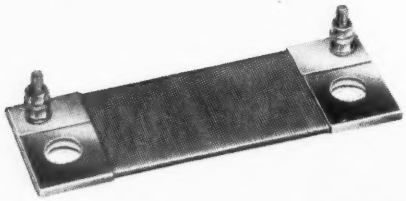

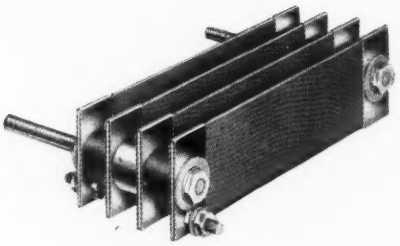

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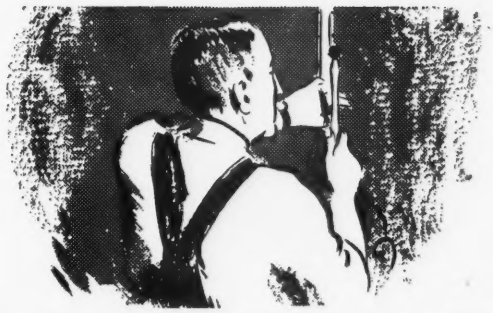
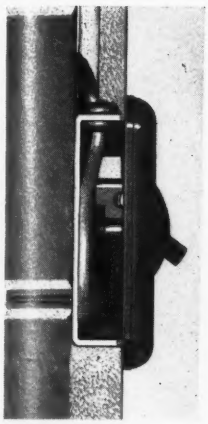


SWITCH TO THE "LINCOLN" TYPE AC

For Plaster-depth Erection



WHILST the new 5 amp. "Lincoln" Type AC switch may be erected in standard boxes to B.S. 1299, its shallow depth makes it particularly suitable for competitive flush wiring schemes.

For such schemes we offer a wide range of extra-shallow boxes. These include a steel box with bushed entries; steel boxes for either round or oval conduit; a cast-iron box for round conduit, and a hardwood box for t.r.s. and similar cables.

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- Full, positive drive from dolly to moving contact. Contacts of heavy gauge, silver-inlaid copper.
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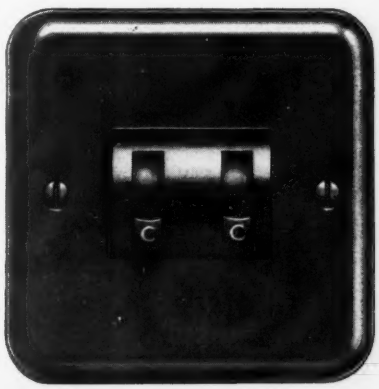
- A competitive switch of robust construction in every way comparable with the other sturdy "Lincoln" wiring accessories.



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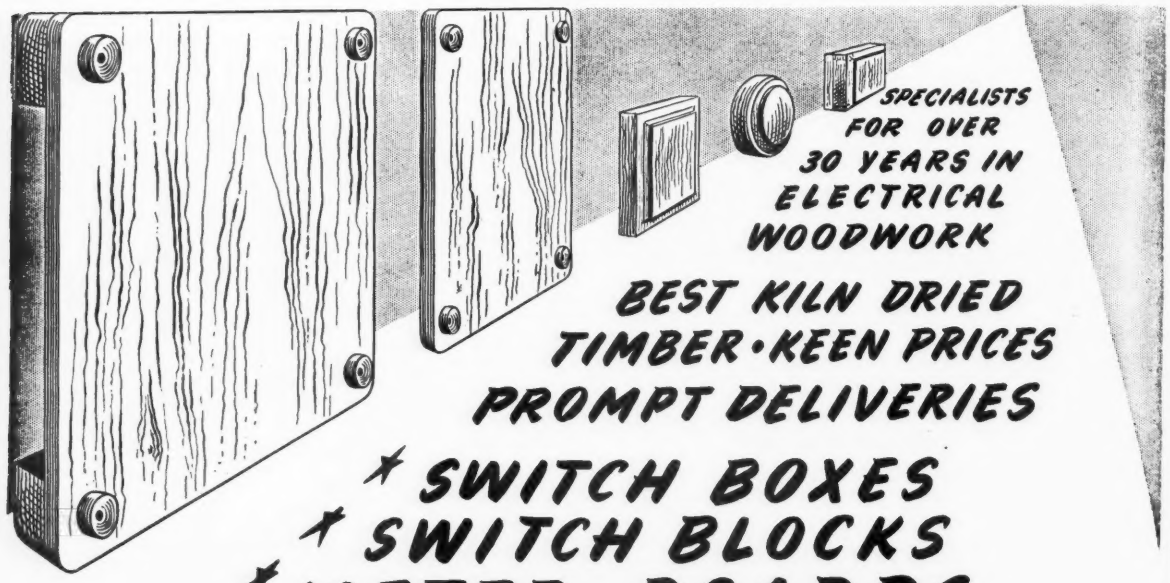

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Eight types of "Ashley" B.C. Lampholders, listed in one hundred and thirty-two variations. All are well designed, precision made from the best materials, and quality controlled. Each one is "Ashley" branded, guaranteed, and reasonably priced.

FEATURES. Moulded, or with porcelain interiors. Brown or white. Brass liners. Spring or solid plungers, with non-rust springs. Easily wired terminals. Lug grip shade carrier rings with brown holders. White holders have short shields. Home Office pattern ventilated shields. Excellent finish. Complying B.S. 52.

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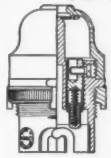
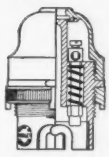
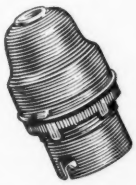
Terminals stationary during lamp insertion or removal.





SOLID PLUNGERS

Terminals move during lamp insertion or removal.



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CORD GRIP 'DREADNOUGHT'

Heavyweight, with porcelain interior, solid plungers, non-rotating cap, and effective cord grip.

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Spring or solid plungers. Choice of six threads:—
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Spring or solid plungers. With screwed bush and grommet, to grip 14/.0076 round twin T.R.S.

BATTEN

Spring plungers. Easily wired body removes from base rear. 2" fixing centres. Available with "loop-in" third terminal.

SIGN

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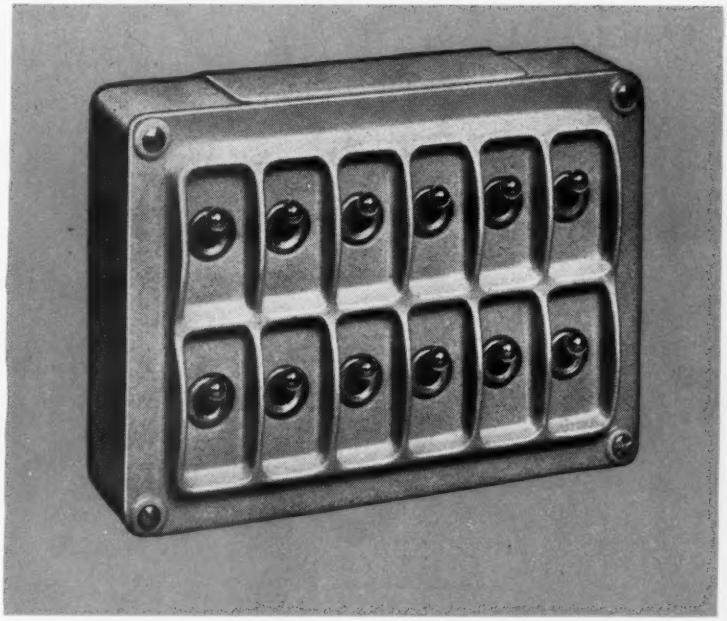

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HOIST BLOCKS
[TYPE CL54]

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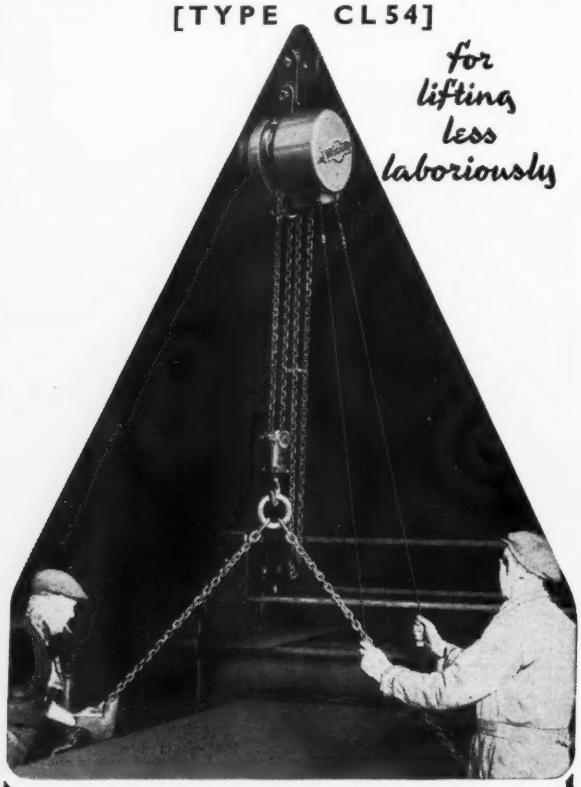

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TO
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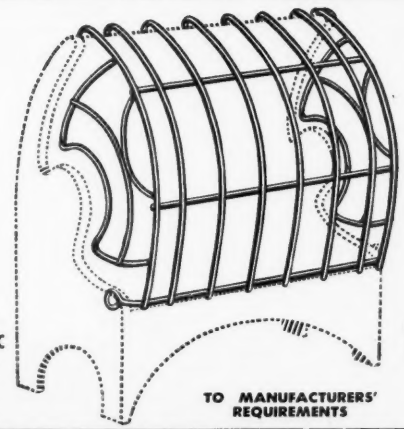

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(Leg model)

(including splashplate, 'Simmerstat' on 8" plate.)

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The Jackson 'Two-Nine-Three' is a large 3-plate low-priced family cooker that your customers will want and can afford.

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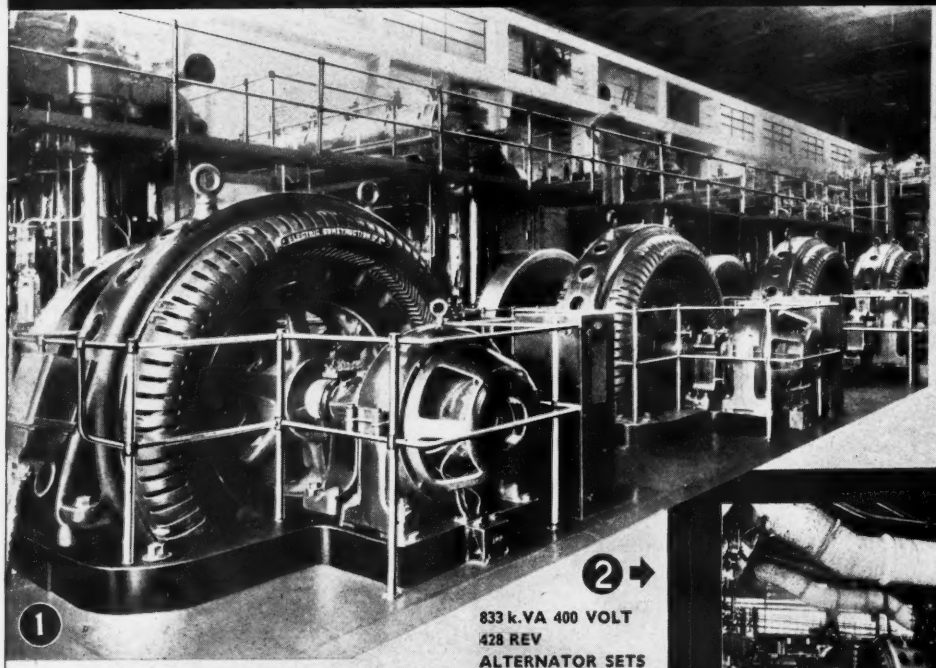

1

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2 →

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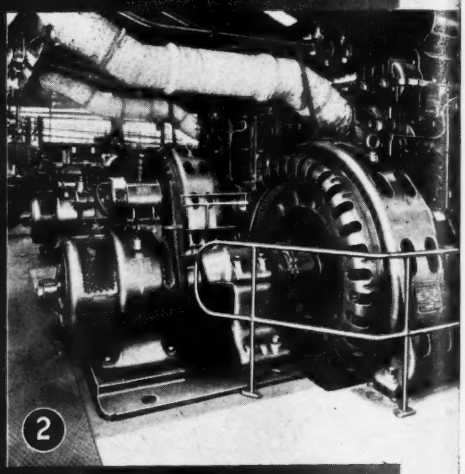
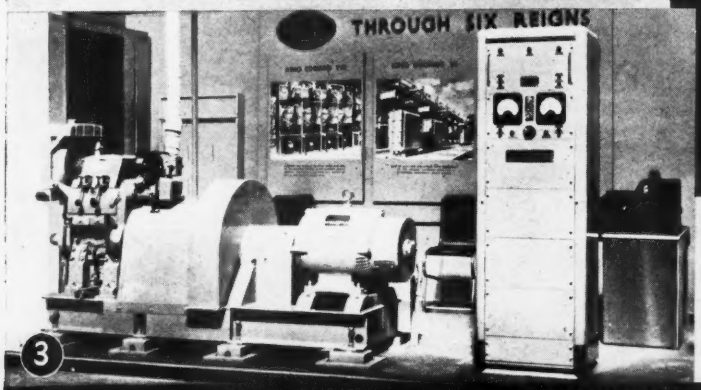


2

Brochure B1720 "ECC ALTERNATORS" Available on request



3

← 3

A 5kW continuity engine alternator set with special NO-BREAK feature specially designed for telecommunications and other essential services (Brochure B1739 gives full details.)

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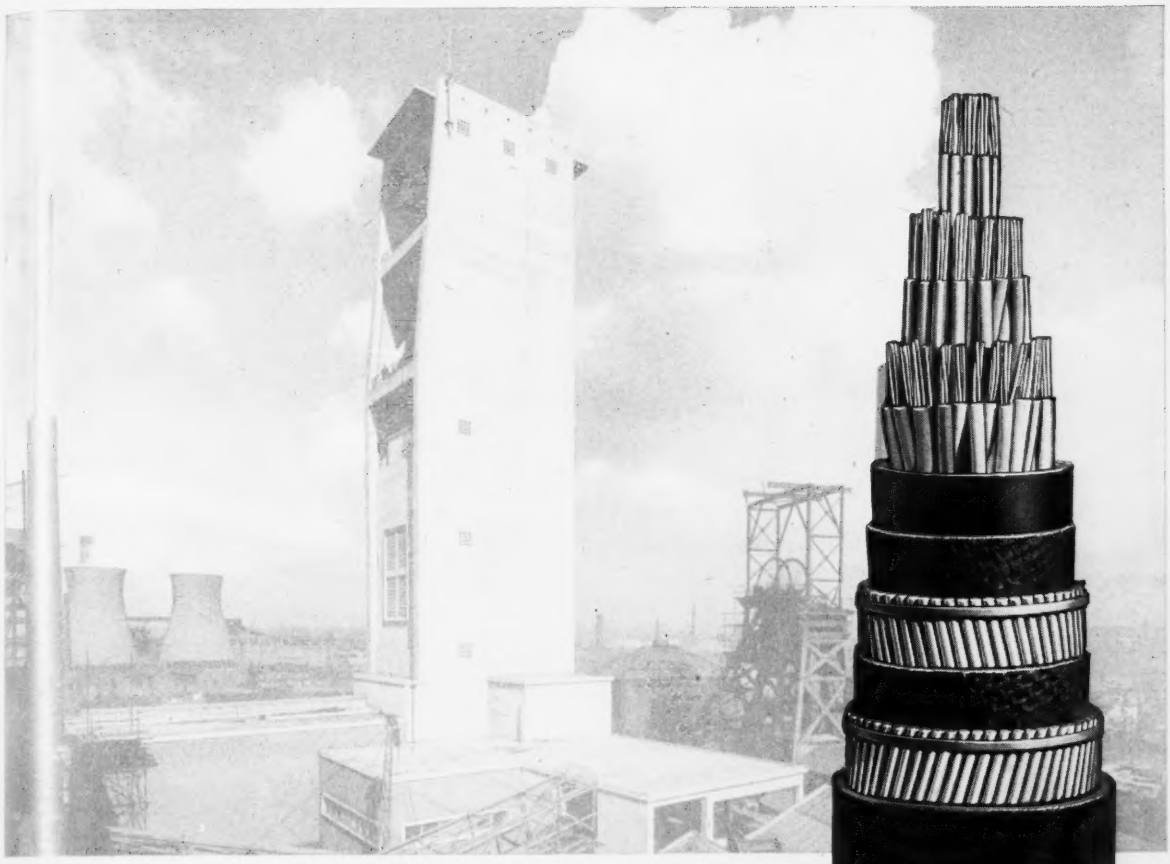

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Compounds

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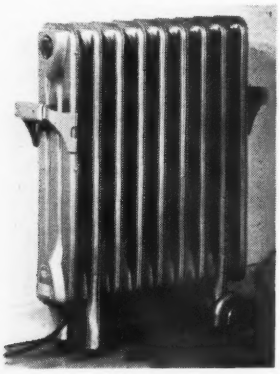

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Some people buy straight lengths while others prefer us to manipulate them to their own special requirements. Either way you can be sure that every length is identical in strength, lightness, concentricity and composition — which all adds up to a smooth running production line with no hold-ups and no bottle-necks to bother you.

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C.38

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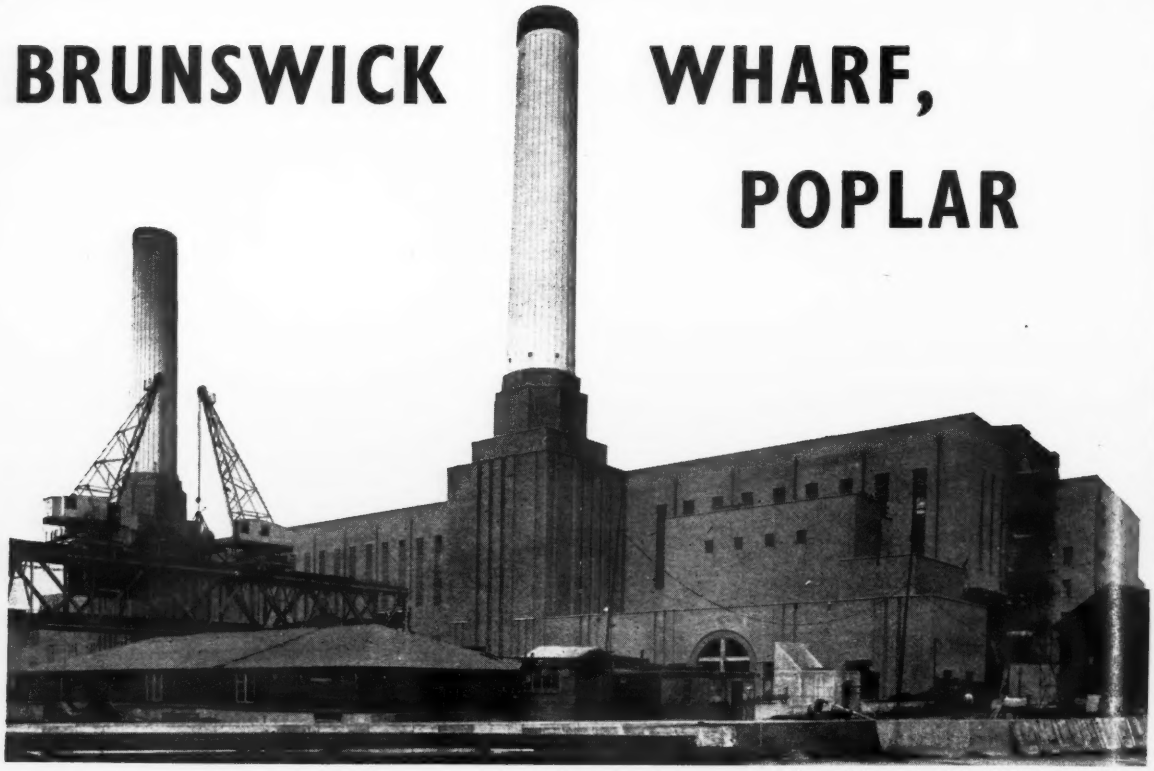

Photograph by courtesy of the British Electricity Authority.

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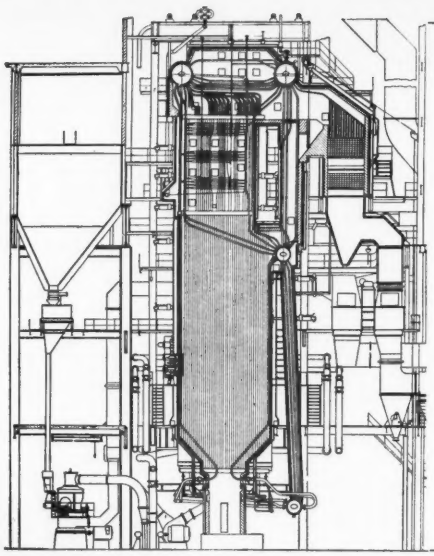

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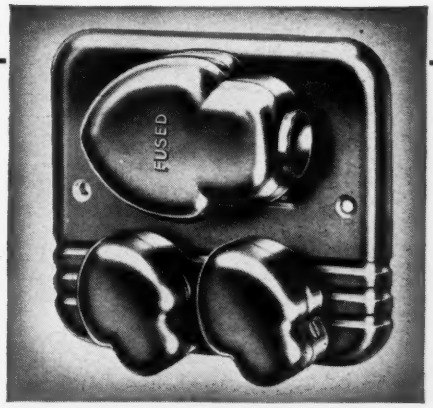

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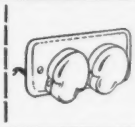
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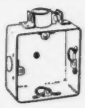
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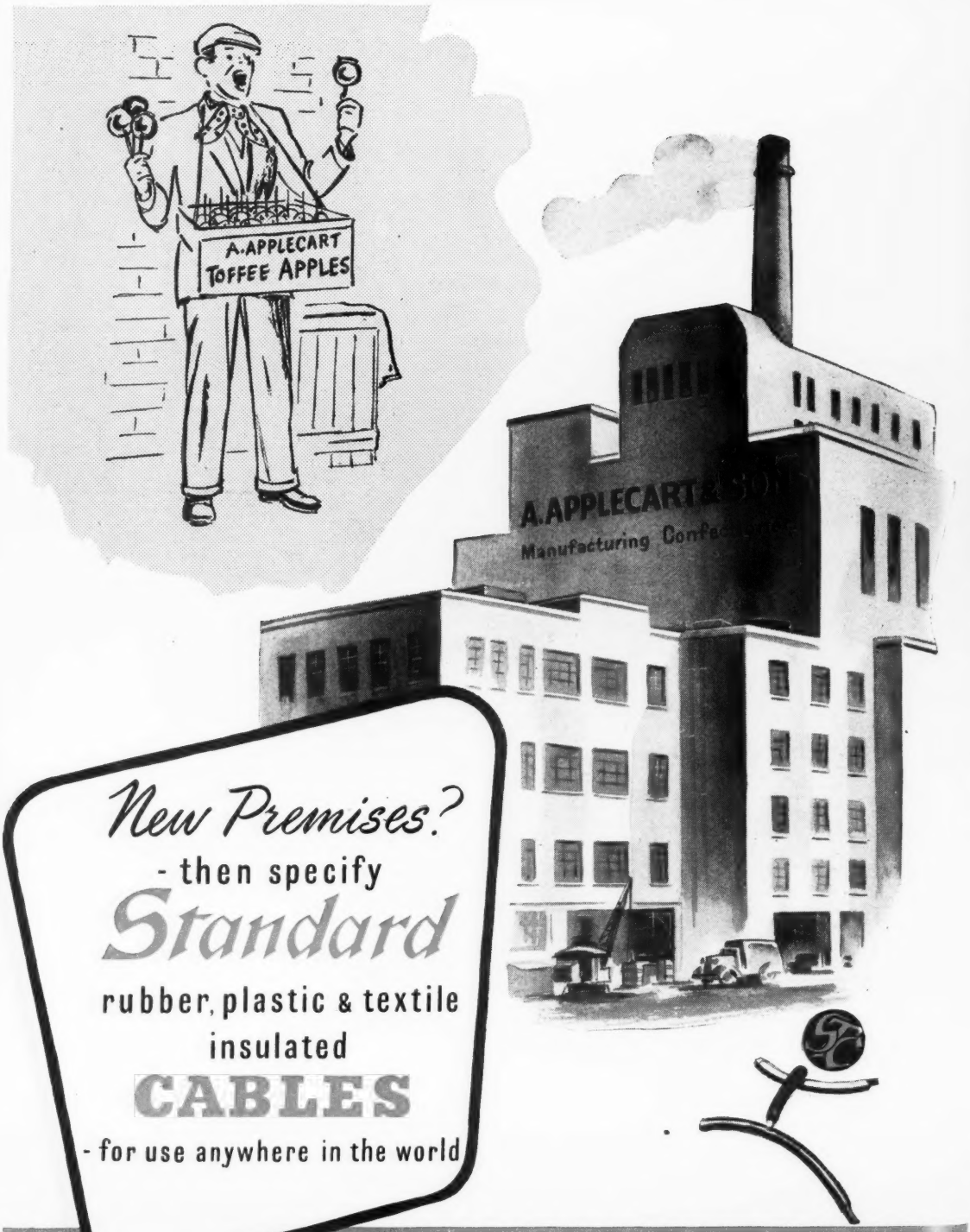

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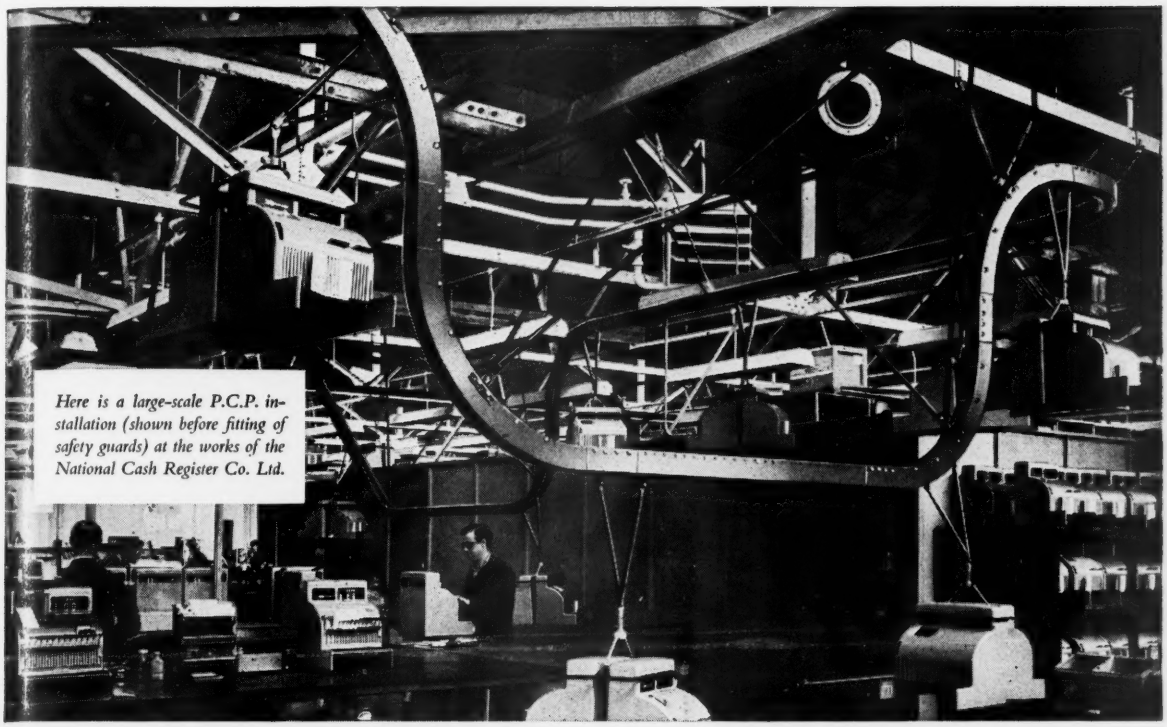

Here is a large-scale P.C.P. installation (shown before fitting of safety guards) at the works of the National Cash Register Co. Ltd.

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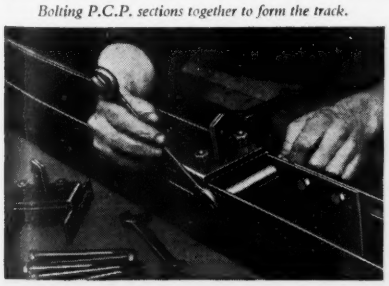
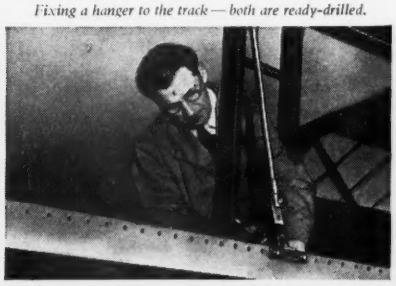
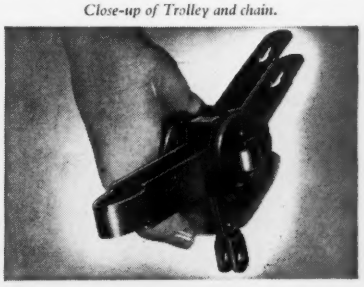
Bolting P.C.P. sections together to form the track.



Fixing a hanger to the track — both are ready-drilled.



Close-up of Trolley and chain.



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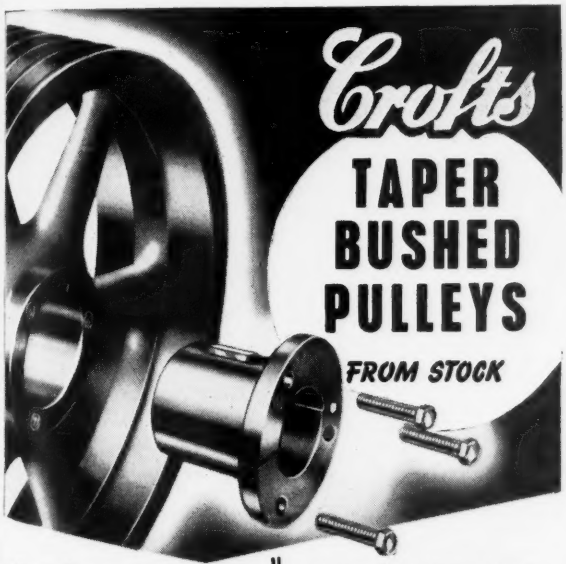

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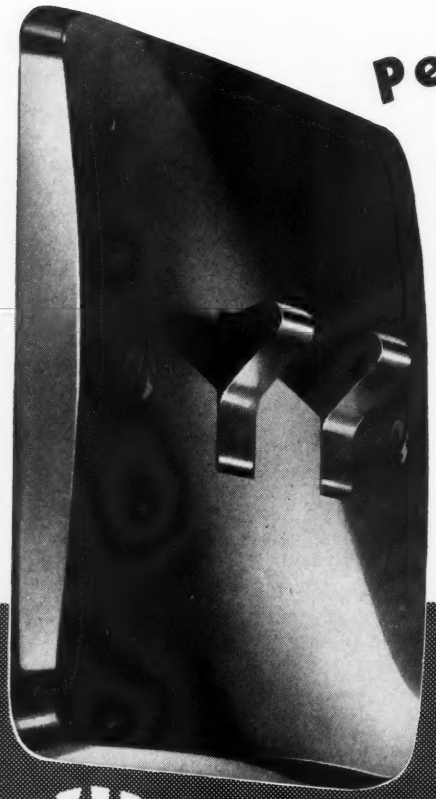

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29 OCTOBER 1954

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VOLUME 155 ✧ NUMBER 18

Eighty-Second Year of Publication

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ELECTRICAL REVIEW

29 October 1954 Vol. 155 No. 18 Established 1872

Research Accommodation

FROM an article in this issue it will be seen that work on the new laboratories of the British Electrical & Allied Industries Research Association at Leatherhead is now well under way and the present hope is that the buildings will be ready for occupation by the spring of 1956.

That will be just about ten years from the preparation of the first scheme by the Association's architect, Mr. H. J. Rowse, F.R.I.B.A. The 1946 scheme would have involved an expenditure of £1 million but it was deferred until the uncertainty caused by the nationalization of the electricity supply industry had been settled. Although it was then made clear that the E.R.A. would have substantial support from the new supply authorities it was decided to proceed only with the first part of the plan at a cost of £600,000. This involved the omission of the proposed high power laboratory and the main accommodation for non-technical services.

When the revised proposals went before the Council early in 1950 it was considered possible to embark on only part of the scheme—to cost £400,000—as it was thought that this amount could more readily be raised. This meant taking over up to three-quarters of the work carried out at Perivale, with room for limited expansion, the Perivale establishment being available for any balance of requirements until the second stage of development at Leatherhead was completed. While the revised plan still included the high voltage laboratory and workshop buildings it restricted the general laboratory accommodation to essentially interdependent researches.

Almost all of the finance for the carrying out of the work at Leatherhead is now available—or soon will be. In the first place £100,000 has been set aside from the Association's reserve for new buildings. A special appeal for contributions has resulted in the raising of over £197,000, so that less than £3,000 remains to be collected to reach the total of £200,000 which must be secured to fulfil the conditions under which a grant of up to £100,000 can be obtained from the Government through the Department of Scientific and Industrial Research.

The completion of the present work will provide the Association with a substantial nucleus of a well-equipped central establishment. This may suffice for the time being, but the inevitable growth of activities will soon necessitate the contemplation of the next stage.

UTILIZATION

Electricity has such a multitude of applications that the chairman of the I.E.E. Utilization Section has the difficult task of choosing between a general survey and concentration on a particular aspect. This year's chairman, Mr. J. I. Bernard, devoted his address about equally to industrial and domestic aspects. In dealing with electric power in industry Mr. Bernard, without excusing British backwardness, gave reasons for the much greater use of electricity in American factories some of which may be applicable only in the United States. Generally, it seems, it is large-scale production which has led to the greater use of power, although it might be said that the reverse has sometimes been true. The electric drive is fully established in this country as the best form, even if it has not been adopted by all industrialists. It is different with heating: in spite of its undoubted merits for this purpose industrial electric heating has not been generally accepted for applications in which it is peculiarly suitable. Headway is being made, as Mr. Bernard showed, but there is still an immense untilled field. In the domestic sphere, too, much more could be done with electric heating if buildings were better insulated thermally. Built-in electric warming systems are likely to become more common if suitable electricity tariffs give the necessary encouragement.

H.F. INDUCTION HEATING

In an article in this issue by Messrs. W. Johnstone and F. McLeish much valuable information is given about the development and applications of the high frequency induction furnace. While the authors point out that there is no doubt that h.f. heating has many advantages over conventional methods, they say that a main drawback is the high first cost of the generating plant and that some future developments will, therefore, depend a great deal on the reduction of this high cost. We certainly do not disagree with these contentions in any way, and we look forward to seeing the cost reduced as much as the authors do. But after seeing some scores of the new equipments in flow-line production service throughout the country we have a strong impression that their adaptability for this purpose must to a very considerable extent offset the high initial cost. In some cases we have seen flow-line production schemes rendered possible only by the adoption of " inductor " heating.

A MIXED LOT

While the committee of inquiry into the operation of the nationalized electricity supply industry is still collecting evidence, the debate in the public Press continues. A lengthy correspondence has been appearing in the *Manchester Guardian*; it has been headed " Time and Hot Water " because it started with a complaint by a reader about the time it took for the local representatives of the Area Board to provide him with an immersion heater. The complainant has received support for his contention that Electricity Boards are careless and dilatory from other correspondents but there have also been letters praising the Boards for prompt and efficient service. One writer tried to draw a red herring across the trail which the Electricity Board hunters were following by reporting the shortcomings of a Gas Board. The conclusion which any unbiased judge must arrive at is that the Boards' staffs vary in quality, and perhaps quantity, from district to district and from time to time, so that generalization is a risky business. It may also be concluded that there is little to choose between Gas and Electricity Boards in the matter of service. One other thing remains to be said : Consumers are not always found to be helpful and some are influenced by prejudice.

OVERALL EFFICIENCY

On the occasion of the visit of the Leeds City Council to the new Skelton Grange power station of the Yorkshire Division of the British Electricity Authority (*Electrical Review*, 15th October) Mr. G. A. Vowles, divisional controller, is reported to have said that the Skelton Grange power station was the most economical one in the country. Because he coupled this assertion with the statements that the station had a thermal efficiency of 29 per cent and an availability factor of 97/98 per cent, and that a few other stations in the country had thermal efficiencies of 30 to 31 per cent, we feel that Mr. Vowles probably had in mind what was known in earlier days as the station commercial efficiency. We would not for one moment suggest abolishing the term thermal efficiency which expresses the operation and design conditions of any given station, but we believe that a revival of the term commercial efficiency would have a very wide appeal in that it would express not only the attributes of thermal efficiency, but also plant availability and loading conditions, as well as the quality of operation and even management. A trouble in the past was the failure to adopt a standard formula by which commercial efficiencies could be arrived at, so that no two generating station commercial efficiency figures seemed to have the same meaning, but now, under a central authority, this difficulty could no doubt be overcome.

CIRCUIT BREAKER TESTING

At the higher voltages now used for transmission, full-scale testing of circuit breakers is often impracticable. Tests with reduced recovery voltage (B.S. 116) do not quite meet requirements, and results with synthetic methods, as used on the Continent and discussed at C.I.G.R.E., do not seem convincing. A much better way seems to be provided by " unit " testing, as pioneered largely by the Association of Short-circuit Testing Authorities and described in the publication reviewed in this issue. Future A.S.T.A. certificates will be granted for breakers for high voltage and high rupturing capacities which comply with these conditions. Rules for unit testing, arising out of British proposals, which are expected to be similar to them in all their main features, are understood to be under consideration by the International Electrotechnical Commission at the present time.

High Frequency Electric Induction Furnaces

By W. JOHNSTONE, A.I.M., and F. McLEISH, M.A., A.Inst.P.*

IN 1831 Michael Faraday discovered that if a closed circuit moved across a magnetic field, an electric current flowed through the circuit. By varying the magnetic field and holding the closed circuit stationary, the same effect was observed. In either case the current flowed only when the circuit was moving, or the magnetic field changing. Faraday named this phenomenon electro-magnetic induction.

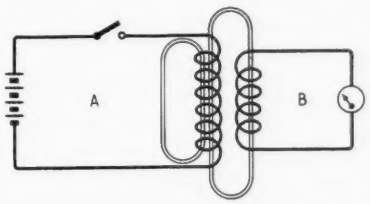


Fig. 1. — Basic circuit

In his experiments Faraday used a circuit similar to Fig. 1. Fundamentally this is the basic circuit for induction heating, for, if the circuit B is replaced by an electrical conductor placed within the confines of the coil of A, and an alternating current is passed through the coil, then an electric current is induced in the conductor. Since every electrical conductor has resistance, the effect of this induced current is the production of heat in the conductor. The source of this heat is twofold, namely the effect of hysteresis losses and that of eddy currents.

If the conductor is magnetic then its molecules become polarized in line with the polarity of the field within the coil. If the polarity of this field is alternating, then the molecules try to realign themselves with the changing field. This causes a tremendous amount of molecular friction which is dissipated in the form of heat. This heating effect is due to hysteresis, which is not very important in high frequency induction heating, since most steels become non-magnetic at the Curie point (about 720 deg C) which is below the temperature required for such operations as heat treating, forging, brazing and annealing.

The main source of heat is the eddy currents. These currents are set up as a result of different parts of the conductor being at different potentials, causing electric currents to flow throughout the conductor and producing heat by virtue of its resistance.

Reverting to Faraday's Laws, we see that they may be expressed mathematically by the formula,

$E = -L\frac{di}{dt}$ .....(1), where E = e.m.f. in volts, i = current in amperes and L = inductance in henries.

Also, since the capacity (C) of a condenser may be defined as the ratio of the charge (Q) on the condenser to the potential (V) this charge produces, then it follows that $Q = VC$....(2), and by definition $i = \frac{dQ}{dt} = C\frac{dv}{dt}$....(3).

Since inductors and capacitors are the basic elements for converting commercial frequencies to high frequencies, it may be as well to examine how this is accomplished. The electromagnetic energy stored in an inductor L carrying a final current I may be shown by considering the work done by the e.m.f.

Work done in a small interval of time dt = Eidt,

$$\therefore \text{ Total work done } = \int_0^\infty Eidt = \int_0^I Lidi \text{ since } E = -L\frac{di}{dt}$$

Hence, magnetic energy stored $= 1/2\ LI^2$ joules....(4). As the current falls to zero this energy flows back into the circuit.

Similarly the electrostatic energy stored in a condenser

$$= \int_0^\infty Eidt = \int_0^Q Edq = \frac{1}{c}\int_0^Q qdq, \text{ since } Q = VC$$

$$= \frac{Q^2}{2C} = \frac{1}{2}CV^2 \text{ joules.....(5)}, \text{ where V is the final}$$

potential difference across the plates of the condenser.

The phase relationships between the voltage and current flowing through inductances and condensers may also be demonstrated, using relations (1) and (2).

If an alternating current $i = I \sin \omega t$ flows through an inductance L, then the voltage across the inductance is given by $v = L\frac{di}{dt} = \omega LI \cos \omega t = \omega LI \sin (\omega t + \pi/2)$; that is, the voltage leads the current by 90 deg.

Similarly, if an alternating potential difference $v=V \sin \omega t$ is applied to a condenser, then the phase relationship of the current is given by $i = \frac{dQ}{dt} = C\frac{dv}{dt} = \omega CV \cos \omega t = \omega CV \sin (\omega t + \pi/2)$; that is, the current is also sinusoidal and leads the voltage by 90 deg. Thus, an inductance behaves like a complex resistance $j\omega L$ and a capacitance like a complex resistance $\frac{1}{j\omega C}$ where $j = \sqrt{-1}$.

If now a condenser be periodically charged and allowed to discharge across an inductance, we have the oscillatory circuit as used in the tank circuits of all types of high frequency induction furnaces.

At any instant t, the potential difference across the condenser balances the back e.m.f. set up in the inductance. If v, q, i, be the instantaneous values of the voltage, charge and current, then it follows from equations (1), (2) and (3) that $\frac{d^2v}{dt^2} + \frac{v}{LC} = 0$ and $\frac{d^2i}{dt^2} + \frac{i}{LC} = 0$.

But these equations are the classical differential equations of simple harmonic motion. They represent the voltage and current vibrating sinusoidally with a period of oscillation given by $T = 2\pi\sqrt{LC}$. Graphically the variations may be represented as in Fig. 2.

If a resistance of any kind be introduced into the circuit,

* Messrs. Johnstone & McLeish are both with A. P. Newall & Co., Ltd.

then the resultant oscillations of current and voltage are characterized by a damping effect, usually of the exponential decay type as shown in Fig. 3.

The Spark Gap Oscillator

The oldest and simplest method of producing high frequency currents is the spark oscillator. It is used mainly for the melting of precious metals and special alloy steels. A simple form of this oscillator is shown in Fig. 4.

In this a high voltage is applied to the condenser until the spark gap breaks down. When this happens a train of high frequency current oscillations passes through the inductor as previously explained. In this case, however, the resistance of the gap is not a constant quantity, but increases as the current decreases. The effect of this is to cause the decreases in successive amplitudes of current to be constant, instead of being in geometrical progression, so that the decay of the wave train will have a definite ending in a finite time (Fig. 5).

Recently the application of water-cooled multiple-quenched spark gaps has increased the frequency range to 200–300 kc/s with outputs up to 35 kW. A modern type of quenched spark gap oscillator is shown in Fig. 6.

In this the multiple spark gaps are energized by the mains frequency through a high voltage transformer. When the spark gap resistance breaks down high frequency oscillations are set up in the tank circuit. With the LC circuits properly tuned maximum currents are induced in the work piece, with, as a consequence, maximum heat.

Tappings from the condensers provide a method of controlling the power output which varies from 25 to 35 kW with a frequency range of 100,000–300,000 c/s.

These units are very suitable for such operations as the heat treatment of small parts, localized heat treatment, surface hardening, annealing, stress relieving and brazing.

The spark-gap high frequency generator is a simple static piece of equipment, relatively cheap in comparison with other types of high frequency generating equipment.

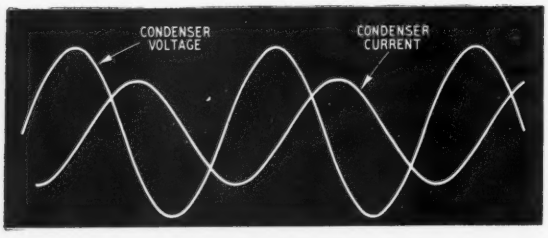


Fig. 2.—Sinusoidal vibration of current and voltage graphically represented

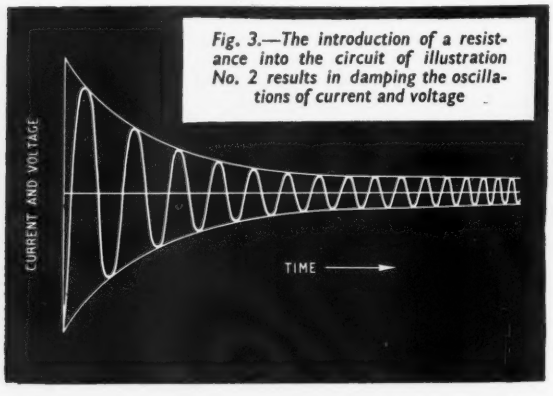


Fig. 3.—The introduction of a resistance into the circuit of illustration No. 2 results in damping the oscillations of current and voltage

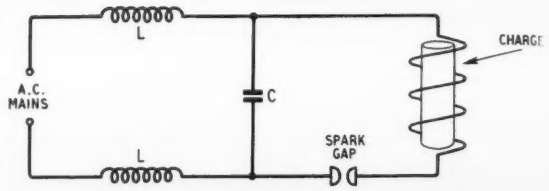


Fig. 4.—Spark gap oscillator

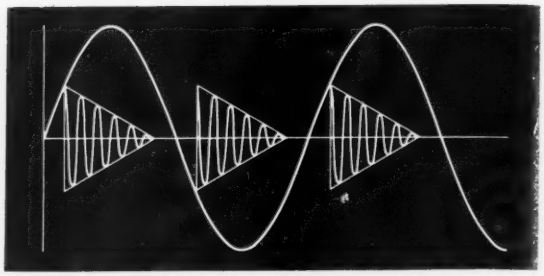


Fig. 5.—The decay of the wave train will have a definite ending in a finite time

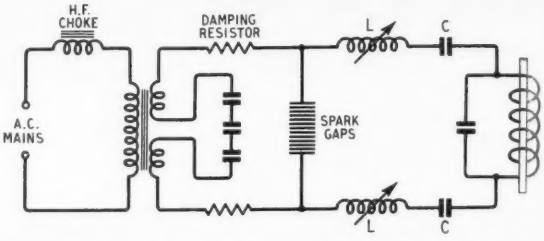


Fig. 6.—Modern type of quenched spark gap oscillator

This initial cheapness is, however, offset by many disadvantages.

The spark gaps require a great deal of maintenance and adjustment because of the very high localized temperatures developed. When large amounts of power are used the instantaneous currents across the spark gaps may rise to thousands of amperes with consequent deterioration of the gaps. Thus the gaps must have constant maintenance. Extreme care must be exercised with the screening of these units to prevent interference with radio and telecommunication services. Not least of these disadvantages is the low power conversion efficiency.

The Motor Generator

About 1925 the motor generator or high frequency alternator became available as a source of high frequency alternating current. This stimulated the development of induction heating, as, with its successful use for the melting of metals, greater generator capacity was developed and applied to problems of heating for forging, through heating, surface hardening, soldering and brazing. Since 1940 a tremendous number of installations have been made in industry for high frequency induction equipment. The main uses of such equipment in industry are for melting, heating for forging, heat treatment and surface hardening.

The principal advantages of the motor-generator type of furnace for melting are threefold. First, the capacity of the furnace is not so limited as that associated with other types of generators. Secondly, there is no contamination of the metal by carbon, since there are no electrodes. Thirdly, there is a more pronounced stirring effect in the melt.

In heating for forging, the power input is limited by the rate of conduction of heat from the outer part of the piece to the inner. If the power input is greater than the rate of conduction then the piece may melt or its surface may be burnt. Proper regulation of the power input must, therefore, be maintained for successful through heating. This may be accomplished in two ways. A high power input may be used over a short period, dropping the power before injuring the surface of the metal. Alternatively, low power may be used throughout the entire heating cycle.

In an automatic bar heater for bolt heading the bars are fed by hand into a magazine on top of the unit and from there they pass into six loading mechanisms, each associated with six water-cooled inductors, which operate in sequence, discharging blanks from the heating coils at the correct forging temperature after one complete cycle. The heated end of the bar can then be fed into the forging press. With this method of handling pieces in sequence, a steady load is maintained on the generator. Unity overall power factor is provided for by adjustment of the condenser bank housed in the base of the unit, where also a tapped reactor, connected to the supply line, provides for power control.

If a bar is not properly discharged or a magazine becomes empty, a safety device comes into action. Across the discharge end of the chute is a gate which sends a signal to a timer each time a bar is discharged. If the bar is not properly ejected then the gate fails to open and the timer shuts off the high frequency supply.

In all types of high frequency induction alternators the armature reactance is inherently very high. This causes large changes of terminal voltage with load. Hence it is necessary to have some kind of automatic voltage control to maintain a constant terminal voltage which is independent of load variations. The electronic type of voltage regulator is preferable if high speed response is desired, since this can maintain the terminal voltage within 1 per cent of some preselected value over the complete variations of load.

In a modern bar stock hardening unit the bar stock is progressively fed through the heating inductor and carried into the quench continuously flowing from the inductor. The angle of incidence of the quench can be modified to suit specific conditions. Increasing or decreasing the angle has the same effect as increasing or decreasing the delay period. Change in the rate of travel of the bar stock through the inductor accomplishes the same purpose as modifying the heating time. By adjustment of the rate of travel and power input, bar stock is heated uniformly throughout to the necessary hardening or tempering temperatures. The inductor heater consists of several turns of copper tubing providing a large area and thus a low power input per square inch and so the heat is generated slowly on the surface of the bar, and flows by conduction to the centre of the bar. The inductor coils in the Tocco bar stock induction furnace are specially designed to ensure complete and uniform heating of the stock.

The heater coils operating in the same line may be used for the complete hardening and tempering of bar stock. The first may be controlled for heating to hardening followed by quenching of the bar to full hardness, and the second for heating to adequate tempering temperatures, depending on specifications. This unit may also be used for annealing, normalizing or stress-relieving.

Surface Hardening

In surface hardening use is made of the fact that the distribution of high frequency currents throughout a system is such that the effective reactance of the system is a minimum, much in the same manner as a direct current will choose the path of least resistance when offered alternative paths. This distribution of h.f. currents in a conductor follows from the principle of minimum stored magnetic energy. This minimum value is obtained at the expense of the energy which is dissipated at a greater rate in the form of heat. Thus, in the surface hardening of metals the induced currents concentrate in those parts of its surface which are closely coupled to the inductor, as then the stored magnetic energy is a minimum, as is the effective reactance of the work coil and charge.

For successful induction hardening many variables must be held rigidly under control. Among these variables are frequency, power input, time of heating, type of steel used, length of the delay period before quenching, and original structure of the steel. For symmetrical pieces the diameter of the piece and the depth of case required are the factors which govern the choice of frequency. If the case depth is to be heavy, frequencies of the order of 3,000 to 10,000 c/s will be sufficient, whilst for very thin cases, 100,000 c/s or more are required. Equally, if not more important, is the rate of power input. If this is too low the case may be destroyed by conduction of heat to the core. The power input must be closely coupled to the time of heating, and the delay period before quenching; otherwise the case effect may not be produced. The original structure of the steel before induction hardening is of the utmost importance. Since the piece being hardened is in the gamma condition for only a fraction of a second, within which all carbides have to go into solution, it is obvious that the original structure of the steel plays an important part in successful surface hardening. The best type of structure is that finely divided sorbite produced by previous hardening and tempering. Second to this is a fine normalized structure.

Because of the very short heating time, it is possible to heat the steel to about 200 deg C above normal hardening temperature without damaging the steel. One danger in this practice, however, is that of producing retained austenite.

Surface hardening has many advantages over conventional methods.

(*a*) Plain carbon steel may be used instead of more expensive alloy steel.
(*b*) Original core properties can be maintained.
(*c*) No scale or distortion is produced, so that hardening can be carried out after final machining without the usual cleaning and straightening operations.
(*d*) No expensive stopping of operations, such as copper plating, are required, since any part can be selectively hardened.
(*e*) No decarburization produced because of the short heating times involved.

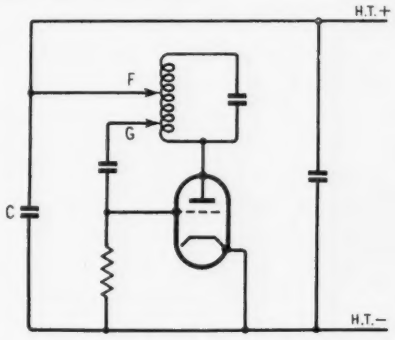


Fig. 7.—The Hartley circuit

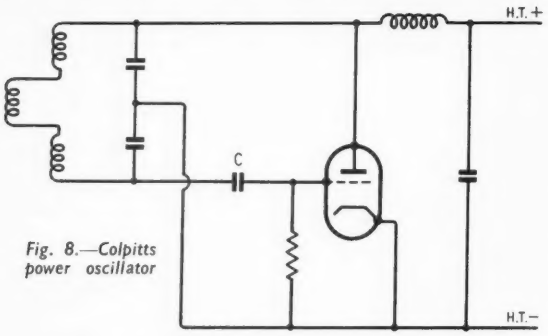


Fig. 8.—Colpitts power oscillator

(*f*) Relative inexpensiveness of the process after the initial outlay has been met.
(*g*) Better working conditions for the operators.
(*h*) Small floor space occupied.

For the production of very thin induction-hardened cases, very high frequencies are required, much higher than the motor generator is capable of producing. This requirement is met by the thermionic valve power oscillator. These units can be made to deliver power at any desired single frequency, ranging from the very lowest up to 200 megacycles per second. For very large outputs of say 100 to 200 kW, the practical range falls to about 20 Mc/s.

The Thermionic Valve Oscillator

For the purposes of induction heating the valve oscillator may be analysed into three parts:—

(1) Power from the low frequency mains is transformed to high voltage a.c. and is then rectified and passed through smoothing circuits, finally emerging as high voltage d.c.
(2) The tank circuit for the production of high frequency oscillatory currents.
(3) The valve to feed in the necessary energy to maintain the high frequency oscillations.

Two very common power sources used in high frequency heating are the Colpitts and Hartley power oscillators. Both are very similar in action. In the Hartley circuit (Fig. 7) the filament tap provides a means of adjusting the grid voltage. If F is assumed fixed, then the necessary adjustment may be effected by the grid tap G.

The h.t. to the valve plate is supplied through tap F. The condenser C serves a dual purpose. It prevents the h.t. supply being short-circuited between the grid and the filament and it also provides an R/F earth between F and the filament, in order that these two points may be at the same oscillatory potential. The function of the condenser and grid leak is to insulate the grid from the high tension supply and produce an automatic negative bias which increases the efficiency of the oscillator. The condenser across the h.t. supply is to prevent h.f. oscillatory currents from reaching the h.t. When an oscillatory voltage is developed across the tank circuit the filament potential is intermediate between the grid and anode potentials; that is, the grid and anode potentials are in anti-phase and the circuit is self oscillatory.

The action of the Colpitts oscillator (Fig. 8) is similar to the Hartley, but is only suitable for low and intermediate frequencies. One method of producing higher frequencies is to place the tuned circuit between the anode and the grid and rely on the inter-electrode capacity of the valve to produce the necessary grid excitation.

Both these circuits, and modifications of them, may be used for high frequency induction heating. The Colpitts type is more suitable, since the inductor of the tank circuit is free from any complications. The Hartley oscillator is better suited to dielectric heating, since in this the condenser side of the tank circuit is free. For safety one plate of the condenser is earthed when used for dielectric heating. The Colpitts oscillator has the corresponding point opposite the inductor earthed when used for induction heating.

The valve oscillator as a source of high frequency power can be and has been applied to most fields of induction heating, ranging from preheating of plastics, drying of synthetic glues to soldering, but there is no doubt that its most fruitful application is to the surface hardening of small steel parts.

There is no doubt that high frequency heating has many advantages over conventional methods, but it also has disadvantages. The main drawback is the initially high cost of the generating plant. Some future developments will, therefore, depend a great deal on the reduction of this high cost. If high frequency power could be supplied to industry much in the same way as the commercial 50 cycles, there is no doubt that designers and manufacturers would look for new applications and develop new equipment to deal with these applications.

Skelton Grange Power Station

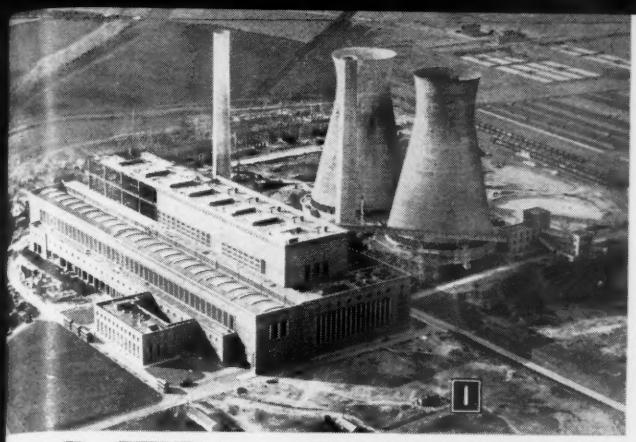
Ultimate Capacity 360 MW

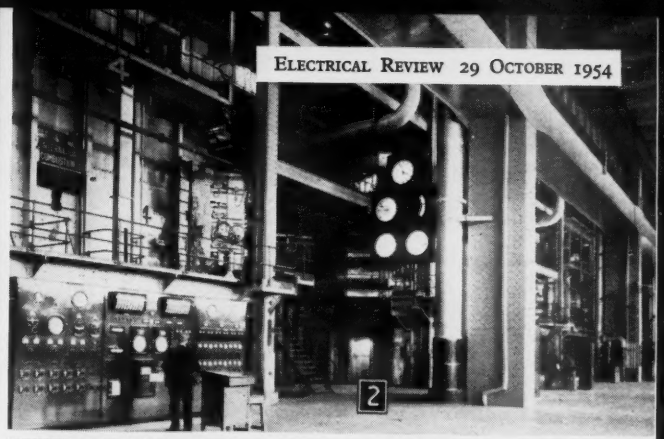
TO mark the occasion of the recent visit of members and chief officials of the Leeds City Council to the Skelton Grange power station of the B.E.A. Yorkshire Division (see *Electrical Review*, 15th October) we publish a selection of photographs of the station and some of its components on the opposite page. The earliest plant in the station was commissioned in 1951 and the station is expected to be completed with a generating plant capacity of 360 MW in 1956. Site clearance work included the excavation of 36,000 tons of coal which was consumed at the Kirkstall power station. The station is mainly served by rail borne coal, but there are facilities also for road borne coal, particularly from opencast sites.

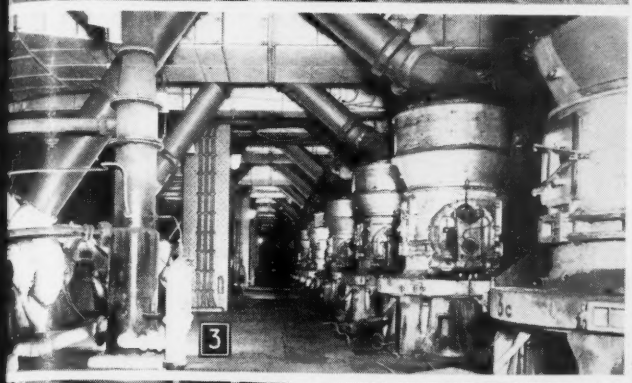
The station is at present connected by grid lines to Ferrybridge, Wakefield, Kirkstall and Low Road, Leeds. The lines to Kirkstall and Low Road serve the Leeds city area, and the Wakefield line connects, via the Wakefield switching station, other grid points at Thornhill, near Dewsbury, and West Melton, near Sheffield. The Ferrybridge line is, in turn, connected to York and from there to Hull, Keadby, near Scunthorpe, and the North Eastern Division, B.E.A. In the near future two additional lines will be established to connect to Rodley and Bradford, and eventually the station will feed directly into the 275 kV supergrid.

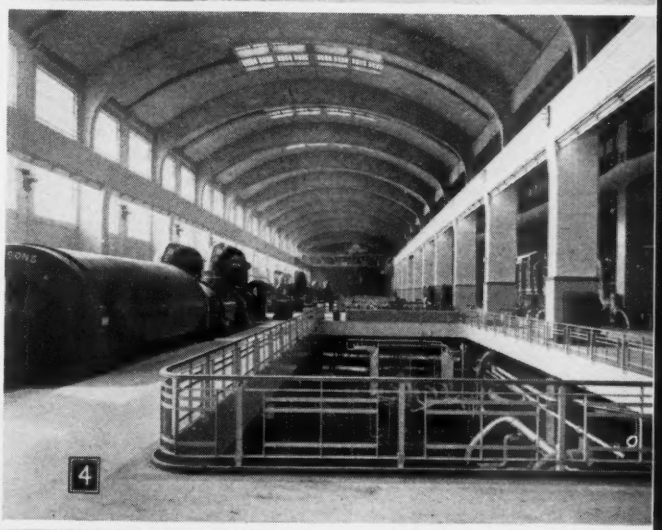
SEE OPPOSITE PAGE

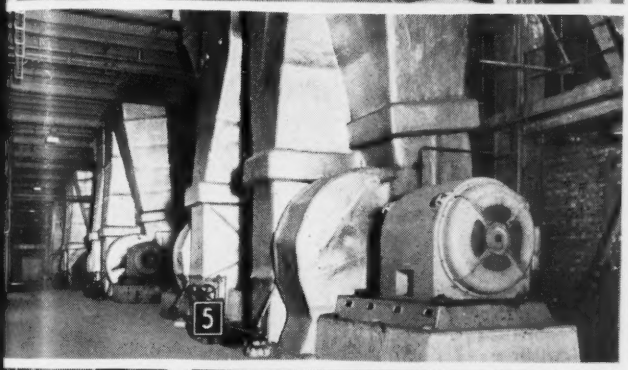
*(**1**) Skelton Grange power station has a total plant generating capacity of 360 MW. (**2**) Each of the six p.f. fired boilers already commissioned has an output of 360,000 lb/hr, the steam conditions being 975 lb/sq in and 940 deg F. (**3**) The pulverizing mills are aligned in the basement. (**4**) In the 750ft long turbine house the 60 MW turbo-alternators are arranged end to end. (**5**) The i.d. fans are particularly well spaced. (**6**) The condenser c.w. pumps (motors only shown) are required to deal with a maximum flow of 360 million gallons of water per day from a complicated system which includes the River Aire, the canal, the Leeds sewage effluent and cooling towers. (**7**) All the main switching and load regulation is governed from a spacious control room. (**8**) The alternators are electrically "tied" to 11·8/132 kV step-up transformers. (**9**) The generator switching is effected by 132 kV circuit breakers. (**10**) Skelton Grange is at present connected by grid lines to West Melton and other points*

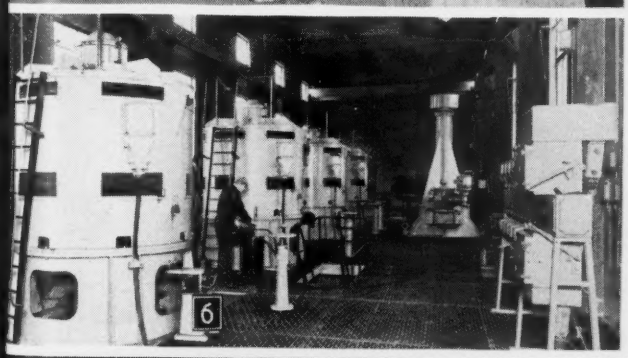


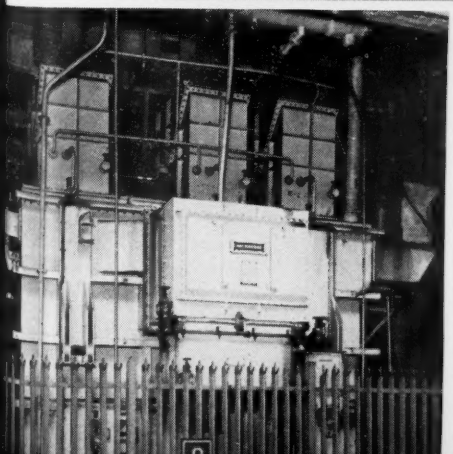


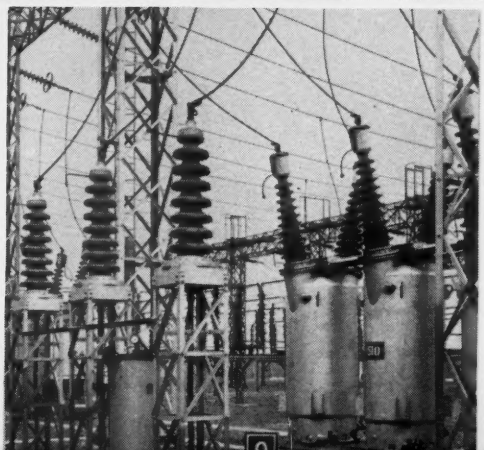












Main laboratory building at Leatherhead as it will appear when completed

New E.R.A. Laboratories

DESCRIPTION OF FACILITIES TO BE PROVIDED AT LEATHERHEAD

DURING the war it became apparent that, to serve adequately the electrical industry in its post-war problems, the British Electrical and Allied Industries Research Association would have greatly to augment its accommodation and facilities. The Council therefore decided to develop a new site and in 1943 about 48 acres were acquired at Leatherhead. At present both the terminal station of the British Electricity Authority's 275/400 kV experimental line and the Testing Station of the British Electrical Development Association are on the site under lease from the E.R.A. The B.E.A. has acquired adjoining land to extend the facilities of its Research Laboratory which is close at hand. Railway facilities are good and large residential areas are within easy reach.

The general scheme comprises first a main building consisting of standard, functionally interchangeable laboratory units, together with library, photographic department, some office and similar special accommodation, secondly a high voltage building, and thirdly a workshop building which will include a canteen.

In December 1953, the main contract was awarded to Gee, Walker and Slater, Ltd. The South Eastern Electricity Board will give an electricity supply from an 11 kV feeder and will be responsible for the substation installation. Building began early this year, and the main contract time is 100 weeks, so that occupation of the new buildings should take place in the spring of 1956.

Structure and Services

The main laboratory will be a steel frame and cavity brickwork structure on three main floors with an additional floor of smaller area. The ground, second and third floors will be of normal height, but the first floor will have a height of 18ft for research work needing greater headroom, but to avoid undue high space a gallery and mezzanine floor will cover one-third of the total area to give not only additional working space but also an observation and working platform. Altogether there are fifteen laboratories each 50ft by 35ft, apart from the accommodation on the mezzanine floor.

Since it will require special power supplies and precision measurement resources, the work on cables and heavy conductors will be based on a laboratory unit on the ground floor, adjacent to the generator room and immediately below the standardizing laboratory. There will be a cable trench for investigations on long conductors in stable thermal environments, floor ducts for interconnections between energy sources, large test objects and non-portable measuring gear, and also ready access to open paved space suitable for tests.

The application of light current and electronic techniques to heavy electrical equipment, with some electrochemical work, will be undertaken mainly in a neighbouring unit with separate space in the mezzanine gallery. This laboratory will be near the m.v. dielectric laboratory since some equipment and techniques are common to both.

Of the switchgear researches, the small scale investigations on the electric arc will be housed in a standard unit arranged for the use of a large Hilger spectrograph, with arcs fed either by sustained or by transient a.c. for circuit-breaker problems, or with standard spectographic spark sources, for general problems. Research on fuses necessarily requires fairly heavy currents, and so will be carried out in a space immediately above the machines and batteries.

The high power short-circuit and similar facilities will be retained at Perivale where the circuit breaker researches which need them will continue, together with certain work on contactors and, sometimes, fuses in so far as higher transient powers are required than will be available at Leatherhead.

No specific allocation has been made for the network analyser, which does not require all the facilities of a normal laboratory. If, therefore, the demands for "versatile" space increase in the meantime, it may be economic to provide separate and less versatile space for the analyser, when it is transferred.

Provision will be made in three laboratory units for research into the properties of materials, particularly insulation. One laboratory will be equipped with a.c. and d.c. supplies up to 100 kV and up to 25 kV at higher frequencies. It will be devoted to the study of the

mechanisms of insulation breakdown under high voltages. A physics laboratory will deal with the behaviour of insulating materials in general, including low voltage types of failure, particularly those of electrochemical origin. The synthesis of ferroelectric materials and the development of unorthodox types of insulation such as aluminium oxide films will be pursued. The department will be completed by a chemical laboratory concerned with chemical aspects of insulation failures and with the synthesis of special dielectrics required in the physics department. The X-ray equipment for structure analysis is controlled by this department.

The department dealing with ignition problems and radio interference will have equipment for observing, at the highest speeds, transient phenomena in short electric sparks and other specialized equipment for research on the problems of the ignition of hazardous atmospheres, concerned in the study of intrinsic safety and the design of flameproof gear, and also useful ignition as in the internal combustion engine. Space will be available in the workshop building for tests unsuitable in a laboratory. Although radio and television interference from ignition systems is topical and important this department covers as well the whole range of interference with broadcasting and radio telecommunications occasioned by power-operated and similar appliances and installations.

Although a great deal of field work on heating and allied problems is carried out on actual installations, a laboratory will be provided containing a model room for studying methods of heating under controlled conditions. One or more of the Association's experimental heat-pumps will be installed there, together with facilities for laboratory-scale work on thermal storage, water heaters, airing cabinets and the like.

The high voltage laboratories will comprise a central hall with an area of 100ft by 50ft and 50ft high flanked by wings at normal height containing a transformer laboratory, generator room, instrument room, dark room, offices, etc. In the high voltage hall there will be a circular pit to accommodate a large oil tank for tests under oil.

The building will house a surge generator of 3 MV, a 50 c/s test transformer set of 1 MV, a high current surge generator and high voltage d.c. equipment, so covering the test voltages which correspond to the highest supply voltages at present used or contemplated. Through the sliding doors it will be possible to take the largest equipment into the laboratory or, alternatively, high test voltages will be transmitted to the open-air testing space or to a h.v. test line. The Association will thus be able not only to extend the range and type of its h.v. work but also for the first time to take its place in the various international schemes sponsored by the I.E.C. and C.I.G.R.E. for establishing h.v. test methods and comparing results in different laboratories.

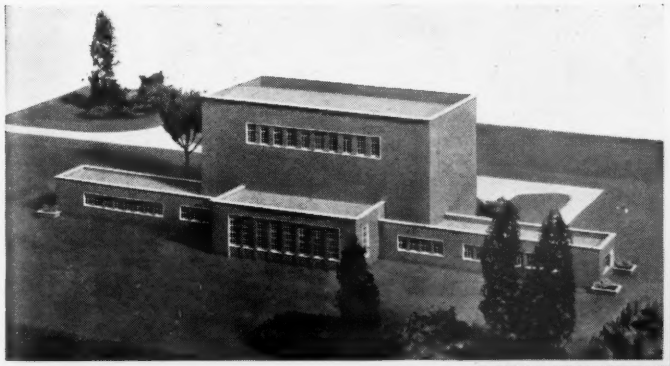
The original scheme for the new laboratories did not envisage electric heating, but since then much research and development has occurred. Accordingly, careful comparative consideration was given to all the technical and economic factors. Among these were the considerable saving if the heavy day-time load could be balanced by a night-heating load to give a high load factor, and the advantage to the Association of ability to study an installation under its direct control, as well as amenity considerations. Electric heating was finally decided upon.

Heating Arrangements

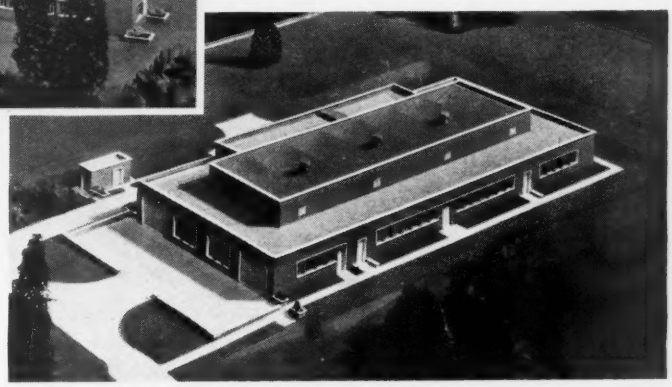
The main building will be heated by electric immersion heaters with hot water storage feeding conventional radiators through a low pressure two-pipe system working at a mean water temperature of 155 deg F when the external air temperature is 30 deg F. The supply of heat to the building will be modulated by varying the water flow temperature, using a well balanced system of automatic control based on thermostats and a programme time switch. Owing to the extended nature of the building, local thermostatic control in each laboratory unit will be impracticable, but the heating surfaces will be arranged to take account of aspect and orientation.

In the high voltage building heating will be by cables in ducts embedded in the concrete floor slab; heat insulation around the perimeter will reduce edge heat losses both above and below the floor level and will be divided into twelve panels each controlled separately by wall thermostats with an additional external anticipatory control thermostat designed to operate according to weather changes. The system will work from a central control cubicle which will also contain accurate measuring instruments. Thermocouples and heat meters are being installed throughout the upper and lower concrete slabs and the performance will be recorded and studied.

The whole of the workshop building, including the canteen kitchen, but not the canteen itself, will be heated in the same way.



Rear view of the new E.R.A. high voltage building



The workshop and canteen buildings

In the canteen portable thermal storage heaters will be used. Advantage will be taken of the opportunity of experimenting with methods of control for these heaters to take into account not only the off-peak supply conditions but also the short periods of daily use. This building will also be fitted with thermocouples and heat meters for the study of both the heating systems installed.

The electrical installation has to satisfy requirements differing from those which apply to normal industrial buildings owing to the varying needs of the individual working spaces. In addition to the 415/240 V main supply there will be d.c. and locally generated supplies, including stabilized 240 V single-phase, and single- and three-phase of variable voltage and frequency from machines in the generator room on the ground floor of the main building. Flexibility in distribution is an essential requirement.

The main supply will be taken and metered at 11 kV from the South Eastern Electricity Board which will run duplicate feeders to a separate substation. The E.R.A. switchgear will comprise two oil-immersed fused switches, with provision for a third on the 11 kV side, each supplying a 500 kVA outdoor transformer. The m.v. switchboard will be in the same switchroom as the 11 kV fuse switches, and underground cables will supply the main incoming switches in the main building, high voltage building and workshop.

In the main building the main switchboard will be in a basement control room where the incoming 415/240 V supply will be controlled by air-break circuit breakers fitted with normal protection and remote tripping for emergency operation from outside the building. Submain boards, one for each wing, will be fed from the main switchboard and from the generator supply board (including d.c. battery supply) in the generator room.

Distribution to rising mains for each wing will be by main distributors run in a cable trench in the ground floor. From a board adjacent to the rising mains in each laboratory, a 240 V single-phase ring main will be run in wall trunking at sill level supplying socket outlets around the walls. In addition, a plug board will be incorporated to link any one of the special supplies to a number of similarly disposed socket outlets. Provision will be made on the board for three-phase supplies to some of the points in each laboratory and for local generators or auto-transformers used to feed the plug-board circuits if required. The working tables and benches will be wired with socket outlets, thus avoiding trailing leads.

In the high voltage building the incoming mains will terminate at a main switchboard in the transformer laboratory. Special supplies taken from the generator room in the main building (d.c., stabilized 240 V single-phase a.c. and a spare four-wire circuit) will also be brought to the main switchboard. Distribution from this will be to separate distribution boards for supplying and controlling machines in the generator room and workshop, to socket outlets through wall trunking round the transformer laboratory and cathode ray laboratory (using a board similar to those in the main building), and to socket outlets partly in wall trunking and partly in floor ducts to give convenient supply points in the testing area in the main hall of this building. In the transformer laboratory there will be additional points for 100 A three-phase four-wire supplies.

The workshop building needs only a 415/240 V mains supply which will be taken from the substation to a main switchboard with conventional incoming supply controls and distribution switches. Flexibility will be achieved by overhead distribution trunking in the main workshops. In addition 240 V single-phase ring mains will supply socket outlets in ancillary spaces, and canteen supplies will be controlled at a separate sub-distribution board.

The off-peak electric space heating in all buildings will cause the major load to fall outside normal working hours. The main switchboard in each of the three buildings will include a separate switch or circuit breaker for controlling the heating supplies which, in the main building, will have a separate heating distribution board with the required contactors and thermostatic control relays associated with the thermal storage heater batteries.

WOOD POLE TESTS

TO obtain basic strength data, tests have been carried out on transmission line poles of wallaba (*Eperua* spp.) from British Guiana. Ten representative poles were selected from a stock held in Kent. All poles had the sapwood removed, were of excellent quality and practically free from surface checks or splits.

All the poles were cut to 20ft in length and tested immediately to destruction in accordance with standard procedure of the laboratory. The poles were tested over a span of 18ft 6in, and the point of application of the load was 4ft up from the butt support point. The results are recorded below.

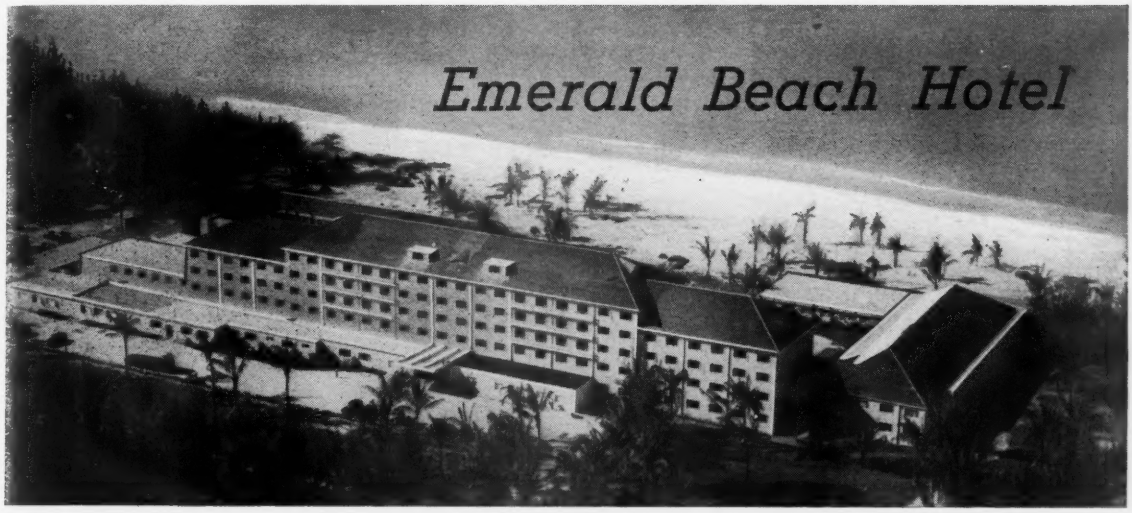
The type of failure was mostly compression under the load point with long splintering tension. An exception was pole 10, which developed longitudinal shear soon after an initial slight compression. The results of tests suggest as suitable values for bending strength and for stiffness, 13,000 lb/sq in and 2·75 by 106 lb/sq in respectively. These are equivalent to an increase of 66 per cent and 80 per cent over the accepted values for imported redwood poles for a corresponding increase in weight of 80 per cent.

Pole No.	Diameter Top in	Diameter Butt in	Maximum bending strength, lb/sq in	Modulus of elasticity or stiffness 1,000 lb/sq in	Weight at 30 per cent m.c. lb/cu ft	Moisture content at test, per cent
1	7·5	8·9	15,630	2,940	58	45
2	7·8	9·5	13,260	2,750	61	60
3	7·2	9·1	11,630	2,890	62	55
4	6·6	9·2	16,240	2,800	65	48
5	6·7	9·0	12,890	2,520	65	48
6	7·9	9·5	10,390	2,830	68	45
7	6·7	8·9	11,930	2,540	64	51
8	6·8	8·1	19,080	3,180	65	53
9	7·9	9·1	14,040	2,970	67	45
10	6·2	8·5	9,480	2,380	65	51
Average	7·1	9·0	13,460	2,780	64	50

The work was carried out by the Forest Products Research Laboratory with material supplied by the Southern Electricity Board and the test results are available at 3s as Technical Report O/T13 of the British Electrical and Allied Industries Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

Gas Turbine Atomizers

DETAILS of the performance of a Power Jets type of swirl atomizer are given in a paper by Mr. A. Radcliffe (National Gas Turbine Establishment, Ministry of Supply) which has been published by the Institution of Mechanical Engineers. From these it appears that it can be designed to give the appropriate output for any fuel of low enough viscosity (about 20 centipoises) and that the effect of varying the atomizer shape can be predicted. Similarly the atomizer spray particle size may be estimated if the air is at a pressure of 1 atm.



British Contractors' Work in Nassau, Bahamas

By S. L. M. BARLOW, Associate I.E.E., M.Amer.I.E.E.

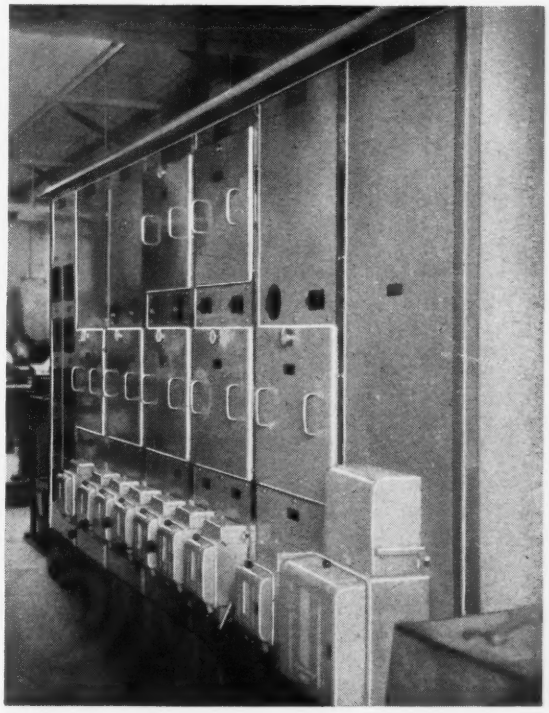
To complete and open to the public a three and a half million dollar, 300-bedroom, five-storey hotel, almost exactly a year from receipt of instructions to proceed, is no mean feat in an accessible location and under normal conditions. To have achieved this with perhaps the most fabulous and luxurious hotel in the world situated on a small island in the Bahamas, is a tribute to British skill and craftsmanship which should not go unnoticed—for this is what has happened at the Emerald Beach Hotel, Nassau.

It is an achievement which has astounded both the local population and the very many American business men and holiday makers who frequent the area, thus giving a very desirable boost to British prestige.

It is doubtful, however, whether many readers will be able to see for themselves the result of this magnificent effort, for season rates under the modified American plan are $30 to $45 a day, and this does not include luncheon. If you are fortunate enough to be able to afford a visit you will be able to spend your time in really faultless surroundings and ideal conditions, but unless you have a spare £20 or so a day to spend, you will need to be content with the following very brief description of this project.

Complete Air Conditioning

The hotel, which is fully air conditioned, is situated on the shores of this Bahamian island only one hour's flight from Miami and the Florida coast. It has a private beach with half a mile of glistening white sand, a superb salt water pool, a beach club, first-class cuisine and public rooms with every amenity imaginable. Each bedroom, many of which have direct access to the beach, has its own bathroom and shower, together with its own air conditioning unit with solenoid valve control operated by a thermostat. There are shopping and banking facilities inside the hotel which is adjacent to the race-course, the golf course and the country club, while the sports catered for include swimming, tennis, water skiing, deep sea fishing, spear fishing, dancing and a host of similar attractions. The gardens surrounding the hotel were constructed with amazing rapidity and incorporate grass and shrubbery imported from Miami together with full-sized coconut



Title photo: Aerial view of the Emerald Beach Hotel looking out to sea. Right: Main control panel for air conditioning system (built by Barlow & Young, Ltd.)

trees transplanted from other parts of the island, and these are floodlit at night to add to their natural charm.

The management is hoping to accommodate many conventions, but it would seem that business discussions would need to be of a very high order to compete with other attractions, and that those attending would need to represent industries perhaps more wealthy than those associated with electricity.

Electricity Supply and Service

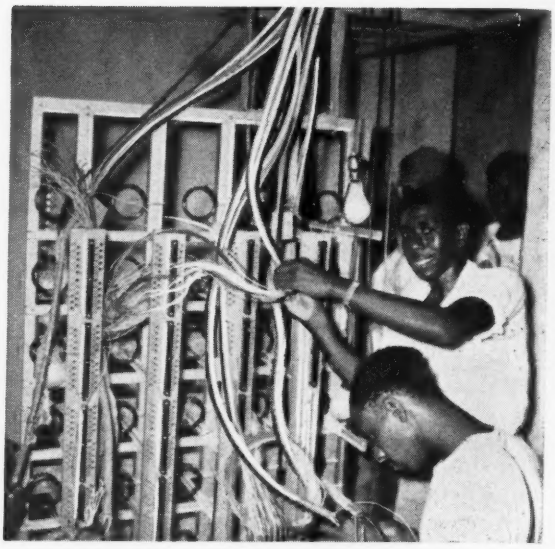
Nevertheless, electricity has played a great part in this project. The 7,200 V electricity supply is carried to within a short distance of the hotel by a pole line erected along the five-mile road direct from the Government electricity supply at Blue Hill power station near to the town of Nassau. This pole line was erected during the close of the last hurricane season and one of the photographs shows what happened to one of the first of the poles erected. This pole was struck by lightning just after it had been placed in position and before the lines were erected, but happily this was the only mishap which occurred on this section of the work.

The service to the building itself is carried from this pole line by underground cables to a transformer station housing three 167 kVA transformers with an output at 200/115 V for the three-phase four-wire system for lighting and small power, and three 167 kVA transformers with an output at 440 V for power. The total connected load is approximately 800 kVA with an anticipated maximum demand of about 600 kVA.

It takes about 450 h.p. of power to condition and circulate sufficient chilled water around the building to maintain comfortable conditions, while about 60 h.p. is required to deal with the flushing water and sewage disposal system services.

The hotel has its own laundry with some of the most modern machinery, rated at some 30 h.p., but the hot water supply for this and for all other purposes is derived from oil-fired high pressure steam boilers. The public rooms are equipped with some very original forms of lighting and lighting fittings, many of which incorporate the local hand-woven basket craft. The swimming pool has most attractive under-water lighting, while the whole area in which it is situated is also floodlit to allow the popular evening bathing parties to take place.

One of the first poles in the h.v. line was struck by lightning



Installing telephone cables in the hotel

There is no complete electrical stand-by system for use in the event of mains failure, but a secondary system is fitted to deal with all emergency services and this is supplied from a 15 kW diesel generating plant.

Communications are provided by a p.b.x. with twenty exchange lines and telephones in every room, while two teleprinter lines have been specially installed. In addition a public address system is available throughout the hotel.

All the electrical installation work in the hotel was carried out by Barlow & Young, Ltd., with English and local labour to Canadian/Nassau regulations for the well-known British building contractors, Higgs & Hill, Ltd., under the direction of the architect, Mr. Michael Rosenauer, F.R.I.B.A., and to make this project possible a special Act had to be passed by the local Parliament.

Polythene Insulated Cables

THE British Standards Institution has just issued a revision of the five year old B.S. 1557, "Polythene-insulated cables, sheathed with polyvinyl chloride, for electric power and lighting up to 250 V." This edition supersedes a previous one but deals only with polythene-insulated cables sheathed with p.v.c. The principal feature of the new edition is the reduction in insulation and sheath thickness which has been found possible as a result of experience since the publication of B.S. 1557 : 1949. Other changes are the inclusion of quality requirements and tests for the p.v.c. sheath and a method for the determination of the grade of the polythene insulation.

It has been considered desirable to specify tinned copper conductors as standard, the main advantages being ease of jointing and resistance to corrosion. The standard reference temperature of 20 deg C has been adopted, as in other recent British Standards for cables. It should be noted that the 250 V cables specified are deemed to be suitable for use on a three-phase 440 V system having its neutral point solidly earthed. Copies of this Standard are available, price 5s, from the B.S.I., 2, Park Street, London, W.1.

I.E.E. Chairmen's Addresses

Educating the Public : Power Plans Outlined

IN his address as chairman of the Utilization Section of the Institution of Electrical Engineers, Mr. J. I. Bernard (British Electrical Development Association) suggested that engineers, in addition to designing and making apparatus, should explain to users what it would do for them.

Reasons for the American operative having from 2½ to 3 times as much horse-power as the British worker included the larger motors required for the more extensive mass production of standardized articles there; a tendency to over-power machine tools instead of, less desirably, to under-power them, as in this country; and automatic operation of machinery so that each worker supervised several processes.

Installed horse-power indicated methods of production and kWh the quantity of production. In the United States the kWh per man-hour rose from 4½ in 1939 to nearly 7 in 1950 and the aim was to raise the figure to 10 by 1960. In Britain the present consumption was only 2 kWh per man-hour.

Mechanical handling plant required little power but enabled more operators' time to be spent on productive work. The clean and silent battery truck was less expensive to run than the i.c. engine type.

Over 90 per cent of high-grade brass was melted electrically. Arc furnaces were increasingly used for melting and refining scrap and high-frequency induction furnaces for tool making. In the United States the arc furnace was beginning to be used for producing plain carbon steel; the capital outlay for a capacity of 250,000 tons a year was estimated to be little more than half that required for an open-hearth furnace shop, while net production costs were lower by $7 a ton.

Local heating, brazing and soldering could be done more quickly and more precisely by induction heating than by any other method. For non-metallic materials, heating by capacitance currents saved much energy and time and the different dielectric losses of different materials could be exploited to provide selective heating of a composite fitting. Electronic applications were worth considering when measurements and inspections required more than the unaided eye or when large numbers of identical articles had to be made.

Electric heating of buildings by thermal storage could be applied in two ways. One entailed making use of the thermal capacity of a solid concrete floor by means of buried bare galvanized iron wires supplied at low voltage or of heating cables or mineral-insulated metal-sheathed cables. The second way was to use concrete blocks heated during the night by an internal element and designed to release the heat during the day at a sufficiently constant rate.

Hot water requirements for a small household could be well met by a 20 gal heater loaded at 0·5 and 2·5 kW. Omission of lagging for an immersion heater would inevitably enforce hand-switching instead of automatic switching. The domestic automatic washing machine consisted essentially of a drum holding the clothes which was turned slowly for washing and rinsing and then fast for spin drying; a third stage should be developed in which the clothes were finish-dried by blowing hot air into the slowly revolving drum. The heating element, which was often offered as an optional extra fitting, should be rated at not less than 3 kW.

Refrigerators with hermetically sealed systems were likely to run with less trouble than the earlier open type compressors and had an appreciably higher efficiency. Adequate storage space at about 0 deg F could be provided for quick-frozen food. Freezer chests for seasonal storage were also practicable.

The value of thermostats for the control of electric heating, other than electric fires, was being increasingly recognized, but there seemed little likelihood of the employment of better structural heat insulation of buildings, which would enable all-electric heating to be used at no extra cost.

New types of kitchen mixers could be fitted with attachments for performing practically every food preparation task.

Shaded-pole motors tended to replace the commutator type because of the need to suppress interference with radio. Where commutators were necessary on account of their higher speeds, mainly in vacuum cleaners, interference suppression had been simplified by the introduction of double-insulated construction, which permitted larger capacitors to be connected to the motor frame without increased risk of shock.

The electrical industry as a whole had not made its weight felt in getting public opinion to regard an adequate number of socket-outlets as part of the essential equipment of a house. The flat-pin 13 A type (B.S. 1363) was by far the most convenient since with an appropriate fuse in the plug any apparatus could be safely connected.

To prevent unsafe apparatus going on to the market after the war, E.D.A. and the British Standards Institution had formed the Advisory Committee on Electrical Appliances. Manufacturers were invited to submit new designs in prototype form to the Committee. Members of the general public should be warned against misuse of apparatus and advised to switch it off when not in use and not to attempt repairs which they were not qualified to carry out.

The Distant Prospect

IMMEDIATE plans of the British Electricity Authority, devised with the distant prospect in view, were described by Mr. J. D. Peattie in his chairman's address to the I.E.E. Supply Section. These provided for the production of 120,000 million kWh in 1965–66 (about twice the present amount), which approached Ferranti's estimate in 1910 that the conversion to 131,400 million kWh of 60 million tons of coal, out of the home consumption in 1903 of 150 million tons, would satisfy all requirements for heat and power. Present day fuel consumption of public electricity supply stations—37 million tons (ten times that in 1903) for an output of 63,000 million kWh—took us half way along the path traced out by Ferranti.

The suggestion of Ferranti that iron ore should be smelted electrically, coke being used only for the chemical reduction process, was looking much more attractive in view of approaching exhaustion of accessible hard coking coals (in contrast to the rising proportion of small coals of high ash content which could be pulverized and used for generating electricity), and of the prospect of nuclear fuel generation.

At 30th June this year the B.E.A. had 19,000 MW installed in its 281 stations, compared with Ferranti's forecast of 25,000 MW in 100 stations; the average thermal efficiency (based on kWh sent out) of 23·54 per cent for the preceding twelve months was within sight of his lower limit of 25 per cent, which would be passed within a year or two.

Steam turbine ratings were being doubled in each decade, roughly following the increase in demand, with allowance for the war years. Sets of 120 MW were under construction for 1,500 lb/sq in and 1,000–1,000 (reheat) deg F and 200 MW sets for 2,350 lb and 1,050–1,000 deg were due for 1959. Boiler house plant constituted by far the most costly part of a power station, but the large outputs of 860 klb/hr and 1,400 klb/hr together with the adoption of unit generation would reduce expenditure on the larger sets. The tendency to rate boilers in MW or in heat units/hour was commended.

Two outstanding problems related to the inadequacy of

natural river flows to serve the needs of large power stations and to meet the new severe restrictions imposed by River Boards on temperature rises of the water. Cooling towers, often using sewage effluent as make-up, evaporated about the same large amount of water as that condensed. Suitable coastal sites were also scarce.

Electrostatic precipitators held the field for the extraction of dust from flue gases. At Little Barford power station, in flat open country, the small residue of dust that left the chimneys did not settle in measurable quantities within two miles of the station.

Costly experiments on flue gas washing showed that the best way of dealing with sulphur compounds was to discharge hot unwashed gases from high chimneys into the upper layers of air for innocuous dispersal over wide areas. The use of oil with its higher sulphur content and the disposal of radioactive residues from nuclear fuel stations posed further problems.

Since 1920 electricity consumption had doubled every eight or nine years. In such countries as the U.S.A. and Canada, with consumptions per head of population far in excess of the British, demands were still rising without sign of saturation. A similar steady rise was occurring in other countries with far less resources.

For some generations native coal would be the principal source of energy, while behind the uranium and other fissile sources there were the vast stores to be released in hydrogen-helium transformation. The heat of the earth's crust was said to arise from the natural fission of uranium in a layer only 25 miles deep and a minute portion had been converted to electricity in Italy and other projects were in hand for New Zealand. Fifty years ago Parsons suggested boring the earth's crust to explore low-lying strata. Mr. Peattie concluded by referring to the demand for more and more energy (the single component of the material universe), as it passed from higher to lower forms, as something far more fundamental than merely bringing to the surface of the earth each year a limited amount of coal.

Lasham Pumping Station

THE Mid-Wessex Water Company's pumping station at Lasham, Hants, which was recently officially inaugurated, has been developed at a cost of approximately £138,000. Two 60 h.p. pump units together capable of raising two million gallons per day, deliver water from the main well to the surface tank which is divided into suction and contact sections. This tank serves the requirements of the six surface pump units housed in the main pumping station and these pumps in turn provide for the requirements of the Swainshill and Lasham Woods reservoirs and the high level water tower at Medstead.

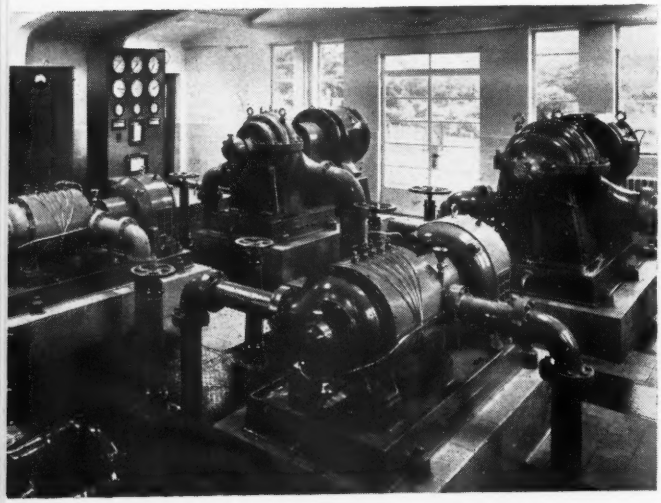
From the suction tank a 12in main supplies the two pump units which feed the Swainshill reservoir. Each unit is driven by a 170 b.h.p. squirrel cage screen protected motor operating at 1,450 r.p.m., the motor being direct coupled to a Worthington Simpson two stage centrifugal pumping unit. A second pair of pump units of smaller output draw their supply from the contact tank. These supply the Lasham Woods reservoir and are driven by 45 b.h.p. motors operating at 1,450 r.p.m., in turn coupled to a Worthington Simpson six stage horizontal centrifugal pumping unit. Two 18 b.h.p. pumps boost the supply to the Medstead water tower.

The control equipment is housed in a six-panel Allen West starter switchboard situated on the side of the pump room; two panels for the Swainshill units house the 170 h.p. auto-transformer starters and two pairs of similar panels are also incorporated in the board for the Lasham and Medstead pump units.

A three-phase a.c. supply is obtained from the Southern Electricity Board and stepped down on site from 11 kV to 415 V by a 500 kVA, outdoor, ground mounting type transformer. The diesel generating plant which is installed as a stand-by comprises a type 8 SRK exhaust turbo-pressure charged, vertical 4-stroke diesel engine. The engine is direct-coupled to a 464 kW alternator which is in turn coupled to a continuously rated d.c. exciter. At some future date it is expected that this plant will operate on a peak-load-chopping basis in order to reduce general station operating costs.

The total cost of the electrical and mechanical plant was in the region of £36,000, by far the biggest item apart from pipe lines (£66,000). The main contractors for the electrical and pumping equipment were the English Electric Co., Ltd., Diesel Engine Division, Rugby.

General view of the pump room showing four of the six surface pump motors which supply the Swainshill and Lasham reservoirs and the Medstead water tower



Unit Testing of Circuit Breakers

WHEN the maximum power of a testing station is not enough to make the full series of short-circuit tests on a multi-unit circuit breaker, the series can be continued by testing individual units after the whole breaker has been tested in accordance with B.S. 116 : 1952. Such unit tests are applicable only when certain conditions relating to mechanical operation and arc extinction are fulfilled. These conditions are set out in a new publication (No. 15) of 15 pages (price 10s) which has been issued by the Association of Short-Circuit Testing Authorities, 36, Kingsway, London, W.C.2, entitled "Rules for the Unit Testing of Circuit-Breakers for Making Capacity and Breaking Capacity." An appendix deals with the determination of recovery voltage for unit tests and the measurement of voltage distribution for the first phase to clear either a three-phase earthed fault on a system with unearthed neutral or an unearthed fault with earthed neutral.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Railway Electrification

I HAVE recently been turning up past copies of popular electrical periodicals, including the *Electrical Review*, and reading reports and articles on railway electrification. I have also noticed that great as is the volume of this literature, very little filters into the lay Press, although somebody outside the electrical industry must read it.

What are these people afraid of, I wonder? I suggest they are afraid of change. We are all very reluctant to alter or abolish established traditions, of which the steam locomotive seems to have become one, and to some of us the idea of scrapping these obsolete machines and replacing them by modern electric ones savours maybe of insecurity, the Unknown Future, perhaps even invading Martians!

It is time that the advantages and urgency of railway electrification were brought plainly before the general public and an end made of the talk of developing "modern steam locomotives" which crops up from time to time. We might as well talk of designing a streamlined stagecoach for all the good it would be.

Weston-super-Mare, Som. M. W. BROOM.

Reversing Earth and Neutral

IN his letter in the *Electrical Review* of 15th October Mr. F. Cooper requests the views of distribution engineers on whether earth currents cause inconvenience and what steps are taken to trace them. I remember that a number of years ago one of the main distribution substations then under my control carried a big domestic load every Monday morning—it was the "wash-day" load. Normally during most of each week the ammeter in the earth current circuit varied between zero and a few amperes, but each Monday morning the earth return indicated up to 120 A. I carried out considerable investigation in order to locate the source of this leakage, but with only moderate success.

One Monday morning while speaking to my wife on the substation telephone she asked me to wait a few moments until she switched off the washboiler as the "clothes were boiling." I observed that the ammeter reading dropped about 10 A when she switched off the boiler. I immediately went home and checked the flexible leads on the three-pin plug and found that the earth and neutral cores were reversed in the plug top. I called upon my next door neighbour and found the same conditions, then went from house to house throughout our housing estate and found seven or eight similar washboilers with wrongly connected plug tops, all of which, of course, appeared to be operating satisfactorily. The reason for these wrongly connected plug tops was, I think, that the firm who carried out the installation of the electrical equipment for this particular housing scheme may have allowed an apprentice to connect up the plugs because of shortage of labour at that time.

One important fact I must mention is that in one of the houses I visited I found the washboiler plug correctly connected up, but my neon tester showed that the installation was of wrong polarity, and it was only by a stroke of luck that a fatality or serious accident had been averted at these premises.

While there is no actual inconvenience to distribution engineers if such earth currents exist, I can assure Mr. Cooper that distribution engineers do their utmost to trace and rectify earth leakage currents for many reasons (statutory, technical and practical). The object of the neutral conductor is obviously to return load safely to its source, and this should not be shunted to water or gas pipes, etc. Many drainage authorities in this country are at present incurring considerable capital expenditure in providing cathodic protection to safeguard their pipes against corrosion by electrolytic action, and I can well imagine the outcry of such authorities if electrical distribution engineers relaxed their constant vigilance in keeping earth leakage currents to a minimum.

Portsmouth. J. SAMSON.

Earth Leakage Trips

IN an advertisement in the *Electrical Review* of 1st October, supplement page 124, relating to earth leakage circuit breakers, it is stated that Regulation No. 1005B of I.E.E. Regulations for the Electrical Equipment of Buildings "requires that if the resistance of an earth electrode to the main body of earth is over 1 ohm, the earthing of the apparatus shall be supplemented by a leakage trip."

Unless there has been an amendment to the Regulations which I have not seen, I do not agree with the above statement. If it were the case then surely nearly all installations should have trips: about which there has been considerable controversy.

Gibraltar. R. J. BAKER, GRAD.I.E.E.

The Case for Tramways

I CERTAINLY do not accept Mr. Warne's assumption (*Electrical Review*, 22nd October) that trams are a primary cause of traffic congestion in cities such as Glasgow, where all roads are wide enough to allow a double tram track with a clear 9ft between the nearest rail and each kerb. Trams may cause congestion in narrow streets of cities such as York, although some Continental operators think otherwise. "Street Traffic Flow" by Watson, the standard textbook on the subject, shows that trams cause less congestion than buses on wide roads.

A motorist colleague confirms my impression as a cyclist that traffic congestion is worse in South London since the trams were withdrawn, as four-lane roads have become three-lane roads with the loss of the discipline imposed by the trams. The only exceptions are New Cross Gate and the Elephant and Castle. At New Cross Gate, delays were caused by the changing of crews at this busy point and cars entering and leaving the depot, aggravated by the slowness over conduit points.

This could have been eliminated by an improved track layout and the use of overhead wires instead of conduit. The conduit system was a cause of delay at all junctions, but fortunately it does not exist in any other British city. The Elephant traffic flow has been improved by a new one-way scheme at the Walworth Road entrance, which would have been equally practicable with the tramways still in operation.

Similarly, there is no sign of any relief of congestion in Central Birmingham since tramway abandonment.

On the other hand, Brussels, which uses trams for all

public road transport, both urban and inter-urban, and has as many motorists in proportion to population as any city in our own country, is noticeably free from traffic congestion.

Congestion could be relieved by providing transport so cheap and comfortable that the motorist would prefer to travel by public transport. The modern tram satisfies this requirement, and can also carry the extra load without giving rise to lengthy queues.

By retaining the tram, Glasgow and other cities will eventually be able to introduce underground subways to relieve congestion in the central area at far less cost than if buses were used.

Highway departments which make the presence of tram tracks an excuse for bad road surfaces have no justification whatever, as it is the buses which cause most damage to the surface. Sheffield has many examples of excellent tarmac road surfaces containing tram tracks, and in some cases the surface between and near the rails is better than the remainder of the road.

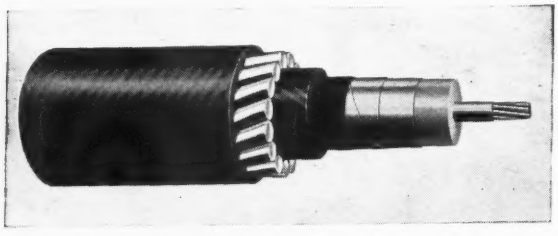
F. K. FARRELL, B.A., A.M.I.E.E.

*London, S.W.*18.

Anglo-Norwegian Telephone Cable

ON 9th October the laying was successfully completed by H.M.T.S. *Monarch* of a new submarine telephone cable between Aberdeen and Bergen. It is a coaxial type cable, and with seven submerged repeaters it will enable 36 simultaneous two-way telephone circuits to be obtained over a distance just in excess of 300 nautical miles, which represents to date the longest submarine telephone cable link in the world.

The cable is of similar construction to the Netherlands–Denmark cables laid in 1950. Like them, it was manufactured at the Telcon Works, Greenwich, by Submarine Cables, Ltd., and the insulator is " Telcothene." The inner copper conductor is a composite structure, comprising a strand of seven wires each of 0·0765in diameter, around which is longitudinally folded a tape measuring 0·775in by 0·015in, the interstices being filled with a suitable compound. This construction provides excellent flexibility, the low d.c. resistance desirable for power-feed to the repeaters, and the transmission efficiency necessary at high carrier frequencies. Polythene of Grade 2, mixed with 5 per cent polyisobutylene and a small amount of antioxidant to guard against slight deterioration of properties during processing, was extruded on to the conductor in a single operation to a diameter of 0·935in. The outer copper conductor consists of a layer of six tapes measuring 0·475in by 0·015in applied with a long lay and bound by an overlapping short-lay tape



Construction of the Anglo-Norwegian telephone cable

0·004in thick. Corrosion protection is afforded by a " Telconax " tape, impregnated with a rubber-bitumen-wax compound. A serving of two layers of tarred jute yarn was followed by alternative types of armour, 15 No. 2 or 21 No. 6 s.w.g. galvanized steel wires, according to the depth of laying, and the cable was completed by two layers of tarred jute yarn applied with bituminous compound. To minimize extraneous electrical interference, the outer conductor for 0·5 nm at each end was insulated with " Telcothene " and covered with lead; in this case the armour was 20 No. 2 wires.

Frequency bands 24 to 168 kc/s in the direction of Aberdeen to Bergen, and 208 to 352 kc/s in the opposite direction, will be used. This is made possible by the inclusion of seven submerged repeaters at approximately 38·8 nm spacing, the largest number to be included so far in a single submarine cable. The construction of the repeaters was somewhat modified from that previously standardized by the Post Office for shallow water. They are of " torpedo " shape, with cable entry at each end, similar in pattern to those it is intended to use on the Newfoundland–Nova Scotia section of the transatlantic telephone project. The cases were made by the Telegraph Construction and Maintenance Co., Ltd., and the internal electrical equipment was supplied by Standard Telephones & Cables, Ltd.; the latter is also supplying the terminal equipment for the present cable. It will be possible to energize the repeaters from either end of the cable, for which purpose d.c. is fed through the inner conductor, the return circuit being via terminal earth plates well separated from the cable to avoid damage by electrolytic action.

The new cable will be connected to London and Oslo by land coaxials. Thus the far-sighted policy of the British and Norwegian Administrations has provided direct telephonic facilities between the capitals, traffic which hitherto has had to be routed via Holland and Denmark.

Train-Initiated Announcements

A NEW system of platform announcements for down trains at Stratford Station from Liverpool Street to the eastern counties was put into service on 11th October. It provides for the automatic initiation of such announcements by the trains themselves and is the first of its kind in this country. The information is recorded on a continuous loop of magnetic tape, 3in wide, with a capacity for 25 recorded tracks. It is pre-selected for each train and then stored electrically until the train operates the track circuit connected with the signalling system. Thereupon the play-back head is moved to the selected track on the magnetic tape, which is set in motion at the same time.

The tape reproducer, which is linked to the station loudspeaker via an amplifier, broadcasts (if the interval between arrivals permits) that the train approaching a stated platform will call at specified places. After passing into a platform track, the wording is changed to refer to the train standing at the platform. The control apparatus consists of British Post Office telephone relays and uniselectors and that for each platform group can cope with four trains. The tape is driven at a constant speed of 7·5 in/sec by rollers and gearing from a 1/20 h.p. motor.

The amplifier equipment with the tape reproducers and uniselector switch mechanism for positioning the reproducer head on any required track were designed and installed by the General Electric Co., Ltd., to the requirements of Mr. A. Moss, signal and telecommunications engineer, Eastern Region, British Railways, whose staff designed, manufactured and installed the keyboards, control apparatus and associated equipment.

VIEWS on the NEWS

By REFLECTOR

PUMPED storage power schemes are not the recent development some people may think. There was a small scheme at Lynmouth, Devon, nearly sixty years ago, and some notes on this from Mr. A. C. Thirtle, controller, B.E.A. South Western Division, appear in the October number of *Northern Lights* (the magazine of the North West, Merseyside and North Wales Division). The station was a water-power plant and during periods of low demand water was raised by a Bailey pump to a reservoir on Summerhill, 800ft above Lynmouth. The reservoir had a capacity of only 190,200 gallons. At peak times the water was released through a 483yd cast iron pipeline to operate a 50 h.p. Pelton wheel generator. Mr. Thirtle says that this system operated from 1896 until 1952 when the station was destroyed in the floods of that year.

* * *

In its annual report for 1953–54 the Gas Council says:—"Where the tenants are given freedom of choice their preference for gas cooking remains undiminished." This is a very bold generalization which, although permissible in an advertisement, is hardly appropriate in a serious statutory statement of facts. It suggests that most of the hundreds of thousands of people with electric cookers have been forced to have them by some sinister agency and not because they have discovered the best means of cooking. In Scotland, especially, tenants of municipal estates have expressed a preference for electric cooking and yet the Glasgow *Evening Citizen* asked in a recent issue:—

> "Why does Glasgow Corporation instal gas cookers in council houses regardless of the wishes of the tenants? . . . Both gas and electricity services are owned by the State, so the reason for favouring gas cannot be due to support for a nationalized undertaking. If the Corporation's preference for gas cookers is inspired by the higher cost of fitting electric ones then the councillors have a case. If not it seems strange that municipal tenants—who are well catered for in other ways—should be denied the right to choose."

* * *

Because the Eastern Electricity Board wishes to charge more for street lighting the Great Dunmow Parish Council is somewhat naturally displeased. One member went so far as to suggest (according to the *Herts and Essex Observer*) that the Council should consider reverting to gas lighting. He declared that it was a pity that the town ever went off gas and added that it gave "a jolly sight better lighting." What next! The substitution of a tin of pork and beans for the celebrated Flitch?

* * *

What is probably a new aspect of the retailing of electricity by landlords of buildings was raised at a meeting of the Yorkshire Electricity Consultative Council. It seems that the Yorkshire Electricity Board had decided to place the landlord of a 22-room building, which had been converted into flats, on the commercial tariff. A protest had been made to the Council which, however, decided to reject it. The supply was metered at one point only so presumably the landlord would have to arrange for tenants' meters or charge them a flat rate for their electricity. Apparently the Electricity Board considers that although the electricity will be used "domestically" the fact that the landlord re-sells it makes the supply a commercial one. This is hard on the tenants who must pay more than the normal rate and it will hardly encourage extensive use.

* * *

A Calcutta correspondent has sent me an extract from an Indian Industrial Tribunal award relating to the mains department of the Calcutta Electric Supply Corporation. It appears from this that the Tribunal was asked to decide whether employees of the department were factory workers or not or, in other words, whether they were engaged in any manufacturing process. In contending that they were, the Workers' Union is reported to have said:—

> "The workmen concerned in the Mains Department actually take part in the process of transformation, transmission and catering of the current generated. The coolies do the work of unskilled labour. The linesmen are responsible for installation and fixation of underground cables and overhead wires. The Head Mistry supervises their work. The Mistries belonging to the Emergency Section attend fusings and general disorders. The mains underground men are responsible for fixation of cubicles, high tension switches and transformers."

I should think that it is likely that too many fusings and general disorders would give any Mistry a fixation of some kind.

* * *

Seventy years ago incandescent electric lighting was still an innovation but it had many enthusiastic advocates who advanced its claims upon all occasions. For instance at the 1874 congress of the Sanitary Institute of Great Britain, held in Dublin, Mr. J. Angelo Fahie, C.E., presented a paper on "Electric Lighting Considered from a Sanitary Point of View." Most of the paper (as reported in the *Electrical Review* of 25th October, 1884) was devoted to proving the virtues of electric lighting by reference to the drawbacks of gas and oil. Mr. Fahie must have made his audience's flesh creep by saying that:

> "in the process of combustion [of gas] the air is contaminated with certain poisonous compounds, such as carbonic acid, carbonic oxide and sulphur which, when breathed—even in a limited quantity—are injurious to the human frame."

On the other hand the electric lamp burned with a pure clear light and after a glowing commendation Mr. Fahie went on:—

> "From this it will readily be seen how conducive to health and bodily comfort are the conditions fulfilled by electric light in contrast with all other illuminants. And not only is the health and bodily comfort affected by the influence of artificial light, but the temperature also; and it is very remarkable to notice the difference in the effect produced by gas light and electric light on the spirits of those obliged to work long hours at night."

INDUSTRIAL NEWS

Storage Heating in Bristol

Following upon the article by Mr. W. F. Walton in our issue of 8th October, the South Western Electricity Board tells us that over 30 Bristol firms have installed storage type electric heaters. Electricity is available at special cheap rates during the night hours, $\frac{3}{4}$d/kWh or often, in the case of a large installation, even less. The Board has a comprehensive scale of off-peak charges.

Pleasance & Harper, Ltd., jewellers and watchmakers, who have installed thermal storage heaters at their premises in Queen's Road, estimate that the capital cost of the installation will be recovered from the saving achieved in running costs by the end of the second winter's use. Another concern using night storage heaters is Simmette, Ltd., manufacturing chemists of Bedminster, who produce nearly $1\frac{1}{2}$ tons of bath cubes a day. To keep their chemicals in good condition they needed a form of heating which did not create a humid atmosphere and at the same time was free from fire risk.

"Lumenated" Ceiling

An architectural lighting system believed to be new to this country has recently been installed in a motor-car showrooms in London. It consists of a ceiling of corrugated translucent vinyl sheet, supported in a framework of lightweight steel, suspended below fluorescent or tungsten lamps. The sheeting diffuses the light to form a completely luminous ceiling without glare or shadow although the intensity of lighting can range from 20 to 200 lumens/sq ft. It is claimed to be the nearest to natural daylight of any yet devised.

The installation presents a light and attractive appearance even in daylight when the lights are not in use. Erection is quick and simple. The steel framework consists of lengths of mild steel H-section track suspended from an existing ceiling by hangers and held parallel by rigid spacer tubes. The corrugated sheet is pulled along between the channels of two of the H-section tracks and held in position by plastic clips.

The complete ceiling, including the steel framework, weighs only 12 oz per sq ft and all metal parts are "Bonderized" and stove-enamelled to prevent corrosion. Maintenance is a simple matter and when necessary the plastic can be washed and re-processed by a mobile laundry run by the manufacturers, Lumenated Ceilings, Ltd., 4, Lloyd's Avenue, London, E.C.3.

Motor-car showrooms of Brew Bros., Ltd., South Kensington, showing a typical "lumenated" ceiling installation

A Gas View

Comparative gas and electricity costs for a family of four were discussed at a recent meeting of the North Western Gas Consultative Council at Partington. A member quoting from an electricity sales promotion circular, stated that cooking for a family of four would require 1·8 therms of gas or 30 units of electricity per week; and water heating (summer) 2·5 therms or 40 units per week. The argument proceeded thus:—"If 40 (units) are divided by 2·5 (therms) this gives 16 units as equalling a therm, likewise 30 divided by 1·8 gives 16·7 per therm. A therm is frequently quoted as being equal to 15 units and even up to 20 units and over. Deciding factors for accuracy are many and include the actual quality of gas in B.Th.U.'s, efficiency of installations—both gas and electric—and, of course, efficiency of appliances, etc." On that basis the document went on to show that for cooking and water heating, electricity was cheaper than gas, by varying percentages, according to the cost of the gas.

Ald. C. E. P. Stott, chairman of the Council, replied that the document was fictitious at all points, but the statements contained in it could be facts under certain circumstances. The evaluation of therms and electrical units was difficult as the theoretical and practical usage did not always conform. Gas and electricity could space-heat and cook, but in comparing appliance with appliance, reservations must be made. It could pay to sell electricity below production cost at the appropriate times. "The electricity industry has by its astute policy enforced a high standing charge which enables a cheap and seductive price to be charged. It is comparable to the Gas Board charging initially 20d per therm and dropping to $3\frac{3}{4}$d per therm. The Gas Board does not encourage the domestic user to consume more and has unfortunately not applied itself to this field. It is regrettable, as expansion would be remunerative and compensatory."

Kitchen Control Unit

A kitchen control unit of special design has recently been installed in the Clarkson School, Wisbech. The unit permits individual control of the various equipments in a large all-electric kitchen from a central point. It was designed and manufactured by the General Electric Co., Ltd., and was supplied to the school under the direction of the county architect, Mr. R. D. Robson, A.R.I.B.A., Isle of Ely County Council. The unit controls all the appliances and lighting circuits in the school kitchen, each individual circuit being controlled by a rotary snap-switch. A red indicating lamp fitted above each switch lights when the switch is in the "on" position. Black labels mounted directly above the switches and engraved with white lettering indicate the various circuits controlled. Each circuit is fused and the fuse compartment, situated above the control panel, is fitted with two locked doors.

New C.V.A. Factory

Early this year the C.V.A. Jigs, Moulds and Tools No. 2 factory was transferred from Kemp Town, Brighton, to a new works with a floor area of 72,000 sq ft on the Hollingbury Estate. Among the wide range of press tools, jigs, fixtures, moulds for die-castings and plastic parts manufactured are precision toolroom lathes, high speed vertical dieing presses (10 to 50 tons), second operation bench lathes, variable speed "H" gears, proof printing presses and special purpose machine tools. The machining section of the factory contains over 120 modern machine tools.

Tunnel Excavation Lighting

One of the world's greatest tunnel achievements has recently been completed in New Zealand. It is the $5\frac{1}{2}$ mile long Rimutaka Tunnel connecting Warrarapa's new rail link with Wellington. Begun in August, 1951, it was completed this year, 14 months ahead of schedule, at a cost of £2,500,000.

During all this time an average of 160 men were working at one end and 180 at the other, on shifts all day and night.

The lighting, as they progressed with the drive, had of necessity to be of a temporary nature and the various fittings were moved from place to place as necessary, being subject to cordite fumes and dust all the time.

The equipment used was supplied by Cory-Wright and Salmon, Ltd., of Wellington, New Zealand, distributors for Benjamin Electric, Ltd.; it consisted of " Crysteel " vitreous enamelled R.L.M. dispersive reflectors and " Duoflux " floodlights which were in continuous twenty-four hour use for nearly three years.

High-voltage Submersible Motor

Some time ago the Harland Engineering Co., Ltd., built an experimental wet type high-voltage submersible motor. This motor was designed for an output of 250 h.p. at 1,450 r.p.m. when running from a 3,300 V 50 c/s supply. Having successfully passed all its works tests it has now, by courtesy of the National Coal Board, been installed in the Castle Pit of the N.C.B. South Western Division for a further period of experimental running under normal operating conditions. This is the first wet type high-voltage submersible motor to be put into operation in Great Britain, and it is believed that it may be the first to be put into normal operation anywhere.

Infra-red Equipment for Australia

R. M. Hoskins Pty., Ltd., textile finishers in Sydney, Australia, have ordered from the General Electric Co., Ltd., infra-red equipment for the thermo-setting of nylon fabric. This will be the first of its type in Australia and will help the development of full-scale nylon fabric production in that country which, hitherto, has only been carried out on a very limited scale. The G.E.C. sheathed wire element, radiant heating panels, which will be installed with a continuous fabric conveyor (pin stenter), will be rated at 60 kW and set nylon fabrics 5ft in width at speeds up to 15 yd/min.

Farming Competition

Young farmers of to-day were turning more and more to electricity and the promise which it held of a better way of life and a contented and more prosperous countryside, declared Mr. S. F. Steward, C.B.E. (chairman of the South Western Electricity Board), at Taunton, when he addressed a meeting of Young Farmers' Clubs representatives from Somerset, Devon and Cornwall. The meeting was arranged to present awards in a competition for Young Farmers' Clubs. They had been supplied with plans and details of an imaginary " prospect farm " which offered considerable scope for improvement and applied themselves to the task of detailed investigation. Visits were made to farms to see some of the many applications of electricity and they also attended lectures and discussions. The awards were presented by Mr. G. H. Johnstone, a member of the South Western Board, who is also vice-president of the National Federation of Young Farmers' Clubs and of the South Western Area. The competition was conceived and sponsored by Mr. Johnstone.

Refrigeration Safety Codes

The Council of the British Refrigeration Association entertained the members of a Sub-Commission of the International Institute of Refrigeration at the Park Lane Hotel, London, on 19th October. The Sub-Commission, representing eight European countries, was meeting in London under the chairmanship of Col. H. Randal Steward, chief engineer of Hay's Wharf, to study existing codes for refrigeration plant with a view to drafting an international safety code.

Mr. R. H. Hemmings, chairman of the B.R.A., spoke during the evening on the necessity for the practical difficulties of the manufacturer to be borne always in mind by those compiling codes and standards. Mr. H. A. R. Binney, director of the British Standards Institution, who was a guest, spoke on the advantages of standards being compiled voluntarily through consideration by all the interests concerned; he also referred to the importance to international trade of the fast developing work of the International Standards Organisation.

Exide Motor Show Lunch

Speaking at the annual Exide Motor Show lunch last week, Mr. H. V. Schofield, director of Chloride Batteries, Ltd., declared that his company was restless to increase its export business and continue to improve its products. Every major advance in battery development in the past thirty years had sprung from Chloride efforts, which in the past two years had resulted in improved performance and efficiency, often coupled with reduced weight. Their aim was to produce the best possible product at the lowest price. Despite growing competition export business had increased tremendously and they had sold batteries at lower prices but to greater value. There was great scope for the use of traction batteries in the elimination of manual effort in industry.

Brush Management Conference

Organization for selling was the theme of this year's Brush Group management conference, held at the Palace Hotel, Buxton, from 14th to 17th October. More than 100 delegates from the Group's factories and headquarters, and including directors, executives and foremen, met together to share their problems and air their views. Speakers included Sir Ronald Matthews, chairman of the Brush Group, Ltd., Mr. G. C. R. Eley, deputy chairman, Mr. Miles Beevor, managing director, and Mr. Ian T. Morrow, deputy managing director. The chairman of the conference was Mr. D. S. A. E. Jessop, group personnel director.

Atomic Building

The U.K. Atomic Energy Authority announces that it is assuming direct responsibility for the building, civil and mechanical and electrical engineering work now being carried out by the Ministry of Works as part of the capital construction programme controlled from the Authority's Industrial Group Headquarters at Risley. The Ministry of Works will continue to function for the present in connection with the work at Harwell and Aldermaston.

B.I.S.R.A. Battersea Laboratories

The work of the London Group Laboratories of the British Iron and Steel Research Association will be open for inspection by anyone interested at 140, Battersea Park Road, London, S.W.11, on Thursday and Friday, 18th and 19th November, between 10 a.m. and 5 p.m. Visitors will be able to see the facilities for conducting research into many aspects of the iron and steel industry's problems, and also learn something of the specific services which B.I.S.R.A. can render.

E.D.A. at Scarborough

The " Four Foundations of Modern Living "—the electric cooker, water heater, refrigerator and washing machine—are being shown on the stands of the British Electrical Development Association at the National Housing and Town Planning Exhibition, Scarborough, now in progress.

Consulting Engineers

A revised list of members, corrected to July last, has been produced by the Association of Consulting Engineers, 36, Victoria Street, London, S.W.1. In this the names are arranged both alphabetically and geographically. Copies are available from the secretary (members 1s; non-members 1s 6d, including postage).

Works Visits

Following their quarterly meeting, held in Leeds recently, chief generation engineers (construction) of the British Electricity Authority visited the Penistone works of the David Brown Foundries Co. The visitors were received by Mr. G. L. Hancock, director and general manager of the David Brown foundry group, and during their tour of the works saw examples of turbine casings for power stations at home and overseas.

Dr. F. Vogt (managing director, Norwegian Waterways and Electricity Administration) recently visited the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd. The company has received orders for

four 37,500 kVA and two 62,500 kVA horizontal waterwheel generators for Aura power station (Norway), which is to be one of the largest hydro-electric stations in Europe, and three of the smaller machines are already in operation. During his visit Dr. Vogt saw work being carried out on the construction of one of the larger generators.

Burmese Customs Tariff Increases

The Government of the Union of Burma have announced increases in the rates of customs duty, effective from 1st October, for some classes of goods including the following electrical instruments, apparatus and appliances: Kettles, boiling rings and rods, cookers, toasters, heaters, irons, lighters, hair dryers, shavers, brushes, hair cutters, automatic door switches and bell apparatus, fans, washing machines, domestic refrigerators. The duty on these goods is raised from 30 to 40 per cent *ad valorem*.

Capital in Industry

The large amount of working capital for each employee in industry is indicated in a humorously-illustrated 12-page booklet produced by Aims of Industry, Ltd., 12, Carteret Street, London, S.W.1. It appears to be aimed partly at the Chancellor of the Exchequer as it shows " how the Tax Devil robs the profits which provide capital reserves " but its main purpose is to convince industrial workers that the reward of the investor of capital is not excessive. One point of interest is the comparatively low investment per worker in the electrical industry (which is really a variety of industries). It is given as £800 for a " typical electrical company " compared with, e.g., £1,800 for shoemaking, £8,000 for cement and £2,250 for sugar refining.

Sales Conferences

Dimplex, Ltd., manufacturers of oil filled electric radiators, recently held two sales conferences in London, which were attended by members of Electricity Boards and representatives of some of the principal London stores. Mr. E. J. Wade, managing director, who presided, said that although production had increased this year by 70 per cent the demand for " Dimplex " radiators was even heavier. Owing to the fact that wholesalers had placed their initial stock orders earlier than usual, however, the supply position was not quite so acute as last year.

Grain Drying

A party of some 30 East Midlands farmers inspected electrical grain drying plants on farms in the Market Harborough area on 21st October. The tour was arranged by the East Midlands Electricity Board to demonstrate the various types of in-silo and in-sack driers and show how successful these plants had been in dealing with this year's exceptionally wet corn harvest.

All of the installations inspected had been designed by the Board's agricultural engineers who have connected 226 grain drying plants in the Area this year.

Electrical Sign Competition

The first electrical sign design competition to be held in this country is being sponsored by the Electrical Sign Manufacturers' Association, Kingsway House, Kingsway, London, W.C.2. The main purpose is to foster an improvement in design technique. It is hoped also that the competition will help to create a better appreciation generally of the value and importance of electric signs for identification and advertising purposes.

The competition is open to all and, to encourage amateur designers to enter, at least one of the prizes will be awarded to an amateur. The first prize is £100 and the second £50; there will be three other prizes of £25. Full particulars can be obtained from the Association.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £270 0s 0d
Fire Refined 99·70%	ton £269 0s 0d
Fire Refined 99·50%	ton £268 0s 0d
COPPER Tubes ..	lb 2s 7½d
Sheet	ton £330 5s 0d
H.C. wire and strip ..	ton £302 15s 0d
LEAD, English ..	ton £107 15s 0d
Foreign	ton £106 0s 0d
MERCURY	flask £110 0s 0d
TIN, block (English) ..	ton £732 10s 0d
ZINC, G.O.B. Foreign	ton £82 5s 0d
Electrolytic	ton £85 12s 6d
BRASS Tubes (solid drawn)	lb 2s 1½d
Sheet	ton £265 0s 0d
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 1d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot : London ..	lb 24½d–25d
Liverpool ..	lb 27d–27½d

New Factory at Brighton

Pullars Instruments, Ltd., have just opened a new factory at Hollingbury, Brighton, Sussex, for the exclusive production of Smiths " Pingers," " Ringers," barometers, and Smiths new electric cooker and washing machine switches. The factory, which has a floor area of 42,000 sq ft, will enable the company to more than double its present output of Smiths products.

G.E.C. Sales Aids

Two sales aids just introduced by the General Electric Co., Ltd., incorporate a " humanized " battery holding a banner bearing the slogan " G.E.C. Batteries—Always Reliable." One model is based on a unit cell lighting battery, the other round an h.v. radio battery. A new battery dispenser for the counter has also been introduced, as well as another sales aid displaying seven types of torches.

Generators for Sao Paulo Fair

Six diesel generating sets have been supplied by Associated British Oil Engines (Export), Ltd., for the Sao Paulo International Trade Fair. They will be used to augment the mains supply and will also act as standby sets in the event of mains failure.

Changes of Name

Crosfield Instruments Ltd., have changed their name to J. F. Crosfield (Agencies), Ltd.

Modern Electrical Industries (Northern), Ltd. has changed its name to Modern Electrical Industries, Ltd.

Trade Announcements

On 1st November the Bedford depot of **British Insulated Callender's Cables, Ltd.,** is to be closed and a new one is to be opened at 81, Dumfries Street, Luton, Beds (telephone: Luton 6866). Mr. W. H. Spillman will be in charge.

The Sturdy Electric Co., Ltd., Burnopfield, Newcastle-on-Tyne, announces that it has completed plans for a new transformer factory and fabrication shop. The new premises will be available next spring.

A. K. Fans, Ltd., 20, Upper Park Road, London, N.W.3, announce that they have now taken over further factory space at 352, Goswell Road, E.C.1, for their range of electronic and aircraft axial and centrifugal flow fans. Mr. A. W. Dean has joined the company in an executive position.

The Cardiff office of **Babcock & Wilcox, Ltd.,** has been moved to 26, High Street (telephone: Cardiff 29366).

Catalogues and Lists

Metropolitan-Vickers Electrical Co., Ltd., 1/3, St. Paul's Churchyard, London, E.C.4.—48-page illustrated priced catalogue of " Metrovick " lamps—season 1954/5.

Cryselco, Ltd., Kempston Works, Bedford.—Illustrated priced broadsheet on " Cryselco " industrial lighting fittings (C.40/2).

Dorman & Smith, Ltd., Ordsal Electrical Works, Manchester, 5.—Technical priced catalogue dealing with " D.S." Class Q h.r.c. cartridge fuses.

Sankey-Sheldon, Ltd., Unistrut Division, 46, Cannon Street, London, E.C.4.—14-page catalogue describing the " Unistrut " method of steel framing.

Nelco, Ltd., Shalford, nr. Guildford, Surrey.—Booklet describing a range of moulded commutators.

British General Mfg. Co. (1941), Ltd., 38, Glasshill Street, London, S.E.1.—Illustrated catalogue of insulated electrical accessories including lampholders, plugs and sockets, bell material, shades and brackets, etc.

Essex Partners, Ltd., 67, Bridgewater Street, Liverpool, 1.—Illustrated priced leaflet on the " Essex " range of flanges or bosses for cylinders and tanks.

Arthur Tipper, Ltd., Victoria Foundry, Willenhall.—20-page priced catalogue on conduit and conduit fittings.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The board of Associated Electrical Industries, Ltd., has reorganized the A.E.I. companies into four groups; the chairman of A.E.I. (**Viscount Chandos**) becomes chairman of each group.

Mr. E. H. Ball

Mr. A. N. E. McHaffie

Dr. C. Dannatt

Dr. I. R. Cox

Mr. G. A. Cheetham

Mr. F. J. E. Tearle

Mr. D. Q. Holland

Mr. B. W. Burnett

The following are the groups and their managing directors:—B.T.H. Group, **Mr. E. H. Ball;** Ediswan-Hotpoint Group, **Mr. A. N. E. McHaffie;** M-V.E. Group, **Dr. C. Dannatt;** and Overseas Group, **Dr. I. R. Cox.** The group managing directors are members of the A.E.I. Board (Dr. Dannatt and Mr. McHaffie were appointed directors from 1st October) and form, with the chairman, the executive committee of the board.

The managing director of the Overseas Group will be the A.E.I. nominee director on the boards of A.G.E., First Electric and Vecor, and will become chairman of A.E.I. (India) and A.E.I. (Pakistan). The B.T.H. and M-V.E. Export Companies will operate as at present. To ensure the closest liaison, however, the managing director of the Overseas Group has become chairman of these companies. **Mr. F. J. E. Tearle** has been appointed a deputy to the managing director of the Overseas Group.

As part of the reorganization **Mr. G. A. Cheetham** joins the board of Metropolitan-Vickers; he continues as managing director of Ferguson, Pailin, Ltd.

Mr. D. Q. Holland has been appointed chief accountant of A.E.I. and **Mr. B. W. Burnett** has been appointed assistant secretary.

Sir Anthony Eden, M.P., the Foreign Secretary, is to be the guest of honour at the annual dinner of the **Radio Industry Council** at the Dorchester Hotel, London, on 1st December. Lord Burghley, president of the Radio Industry Council, will preside.

Mr. B. L. Scott, B.Sc., A.M.I.E.E., has been appointed engineer-representative responsible for the sales of Ellison electric switchgear and hydraulic valves in Northern Ireland. Mr. Scott joined George Ellison, Ltd., in 1951.

Mr. J. A. Spence, B.Sc., M.I.E.E., A.M.I.Mech.E., formerly transmission engineer, Merseyside and North Wales Division, British Electricity Authority, has been appointed deputy divisional electrical engineer to the new North West, Merseyside and North Wales Division. Mr. Spence was educated at St. Andrews University and served his apprenticeship as a fitter with J. F. Low & Co., Scotland, later becoming junior engineer to the Dundee Corporation Electricity Department and college apprentice with the Metropolitan-Vickers Electrical Co., Ltd. From 1933 to 1939 he served with the Central Electricity Board in the East Lancs. Section of the N.W.E. Area as first assistant section engineer. This was followed by four years' service as assistant transmission engineer to the Metropolitan Electric Supply Co. and from 1944 to 1948 he was resident engineer for Northern Ireland with Messrs. Kennedy & Donkin.

Mr. J. A. Spence

Mr. G. Dorrington, M.Inst.F., superintendent of the Luton generating station, is retiring from the service of the Eastern Division of the British Electricity Authority on 30th November, after having completed forty-nine years in the industry, the whole of which has been spent at Luton. His service commenced as an apprentice in the Electricity Department of Luton Corporation and he has held the appointment of station superintendent at Luton since 1926. **Mr. H. Jagger,** A.M.I.E.E., M.Inst.F., deputy station superintendent at Letchworth, has been appointed station superintendent at Luton and will commence his duties on 1st December.

Mr. W. J. Ebben, education and training officer of the Fraser & Chalmers Engineering Works of the General Electric Co., Ltd., retired last month after thirty-seven years' service with the company. Mr. Ebben started in the Electrical Department and in 1920 was appointed works engineer. At the same time he was given charge of pupils and apprentices, a post which he held until his retirement. He initiated the Works Safety Committee and after the last war was its chairman and secretary.

Mr. W. J. Ebben

The Brush Group, Ltd., announce that the following changes will shortly take place:—**Mr. S. Webster,** at present managing director of Bryce Berger, Ltd., will become deputy managing director of the National Gas & Oil Engine Co., Ltd.; **Mr. B. D. Giordan,** works director of Mirrlees, Bickerton & Day, Ltd., will become managing director of Bryce Berger, Ltd.; **Mr. D. G. Hawkins,** general manager of the National Gas & Oil Engine Co., Ltd., will become assistant group sales director; **Mr. R. G. Hooker,** works manager of J. & H. McLaren, Ltd., will become general works manager

and director of the Brush Electrical Engineering Co., Ltd.; and **Mr. B. R. Cant,** personal assistant to the group managing director, will become works manager of J. & H. McLaren, Ltd.

Mr. Roland Whittaker has been appointed a director of Gordon Wilson (Wholesale Electric), Ltd. Mr. Whittaker was manager and a director of J. & D. Ellison, Ltd., of Colne, until he was compelled to resign for health reasons two years ago, after which he joined Gordon Wilson (Wholesale Electric) as sales manager.

Mr. R. Whittaker

On medical advice **Lieut.-Col. J. F. Todhunter** has relinquished his appointments as director and general manager of Murex Welding Processes, Ltd. He is not completely severing his connection with the company, his services having been retained as a consultant. Colonel Todhunter joined Murex Welding Processes in 1936, becoming general manager in 1946 and a director in 1948. He was elected a member of the Council of the British Welding Research Association in 1949 and became chairman of the B.W.R.A. Finance Committee in that year. He is continuing to serve in these offices and as chairman of the B.W.R.A. Housing Association.

Mr. J. M. Willey, deputy general manager of Murex Welding Processes since October, 1951, has been appointed to succeed Colonel Todhunter as general manager. He was trained as an electrical engineer with J. H. Holmes & Co., Ltd., later joining the Metropolitan-Vickers Electrical Co., Ltd., as technical assistant. With the formation of the Welding Department at Trafford Park he was responsible for all sales, and jointly responsible for development work on automatic welding equipment, resistance welding machines, atomic hydrogen equipments and electrodes. After a period as managing director of Rockweld, Ltd., he joined Murex Welding Processes as personal assistant to the general manager, later being appointed to the delegate board of the company. Mr. Willey has served for a number of years on the Council and committees of the Institute of Welding.

Mr. K. A. Maclean, B.Sc.(Eng.), A.M.I.Mech.E., who until recently was assistant to the general works manager of the Northern Aluminium Co., Ltd., has been appointed head of the Fabricating Division of Aluminium Laboratories, Ltd., Banbury.

Mr. J. U. Vass, works manager and director of the Consolidated Pneumatic Tool Co., Ltd., was honoured by his colleagues at a gathering in Fraserburgh to mark his retirement after forty-four years with the firm. The managing director, Mr. Norman Readman, of London, handed over a television set and other gifts to Mr. and Mrs. Vass. Over 1,000 workers attended the ceremony.

Mr. T. W. Jackson, who has been in charge of the Publicity Department of A. Reyrolle & Co., Ltd., since 1946, is retiring on 1st November for health reasons. Mr. Jackson joined the company in 1911 as an apprentice and after three years in the Forces during the 1914-18 war returned in 1920 as a contracts engineer, subsequently handling many large contracts for major power stations in this country. He was latterly a member of the B.E.A.M.A. Publicity Committee.

On 17th October Mr. Leslie Gamage, vice-chairman and joint managing director of the General Electric Co., Ltd., made a presentation to **Mr. W. J. Hitchcock,** supervisor of the packing section of the Despatch and Packing Department, who has completed fifty years' service with the company.

Mr. D. C. Lorkin, joint managing director of Lancashire Dynamo & Crypto, Ltd., who recently underwent a major operation, thanks his many friends for flowers, letters and messages of goodwill. He will shortly be returning to his home at Northwood, Middlesex, for convalescence and hopes to be back at his office early next year.

Mr. W. H. McFadzean, chairman of British Insulated Callender's Cables, Ltd., left by the "Queen Elizabeth" last week for New York. While in North America he will visit Canada in connection with B.I.C.C.'s important interests there and he will return to this country in early November.

Mr. A. H. Young, M.I.E.E., has been appointed deputy chairman of Edmundsons Electric Co., Ltd., and **Messrs. G. H. Bowles, A. G. Lindars** and **E. H. Maltby** have been appointed directors.

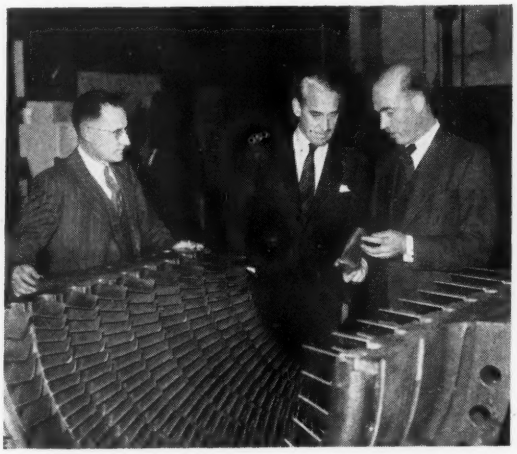
Sir Walter Puckey, president of the Institution of Production Engineers, has been appointed a member of the Television Advisory Committee.

The eighteenth annual dinner of the **B.T.H. Overseas Association** was held at Rugby on 15th October, the guest of honour being the Rt. Hon. H. L. d'A. Hopkinson, P.C., C.M.G., Minister of State for Colonial Affairs. Also present were Sir Charles Westlake, chairman of the Uganda Electricity Board, and Viscount Chandos, P.C., D.S.O., M.C. (until recently Mr. Oliver Lyttelton), chairman of the British Thomson-Houston Co., Ltd.

Before attending the dinner Mr. Hopkinson paid a visit to the company's Rugby works where he was welcomed on arrival by Mr. E. H. Ball, managing director, B.T.H., and later conducted on a tour of the works by Mr. W. S. Steel, director, plant and apparatus sales, and Mr. H. L. Satchell, director and manager, Rugby works. Equipment destined for service in the Colonies was naturally of particular interest to Mr. Hopkinson. This included two 2,500 kW gas-turbo-alternator sets for the Nairobi South power station of the East African Power & Lighting Co., a fourth 5,000 kW turbo-alternator for Trinidad and Tobago Electricity Commission, and two 16,700 kVA waterwheel alternators for the Owen Falls station of the Uganda Electricity Board.

At the dinner in the evening the chair was taken by Mr. K. R. Hopkirk, director, chief mechanical engineer, B.T.H., and president of the Overseas Association. The toast of "Our Guests" was proposed by Mr. J. G. Boddy, deputy manager, turbine sales, and vice-chairman of the Association, Mr. Hopkinson responding. The toast, "The Company," was proposed by Mr. W. B. Dodd, a Canadian who has been with B.T.H. under the Athlone Fellowship Scheme for two years, the response being by Mr. H. E. Cox, manager, B.T.H. Willesden works. "The Association" was proposed by Mr. G. E. Walker, secretary, Associated Electrical Industries, Ltd., and Mr. G. R. Owen, B.T.H. Export Co. representative in New Zealand and ex-B.T.H. apprentice, responded.

Members of the **B.T.H. Willesden Social and Athletic Club** held their annual ball at Wembley Town Hall on 14th October. The Mayor and Mayoress of Wembley were guests. The dance was well attended and an exhibition of ballroom dancing contributed to the success of the evening.



Mr. H. L. d'A. Hopkinson (centre) with Mr. W. S. Steel (director, plant and apparatus sales) inspecting half of a stator frame for the second 2,500 kW gas-turbo-alternator for Nairobi South power station

To celebrate the completion of fifty years' continuous service with J. H. Tucker & Co., Ltd., **Mr. S. G. Smith,** Scottish manager, was entertained at a dinner held in his honour at the Grosvenor Restaurant, Glasgow, on 19th October. Mr. John H. Scott proposed his health and on behalf of the directors of the company Mr. J. B. Tucker, managing director, presented Mr. Smith with a television set.

At a dinner and dance given by the directors of **Wright Electric Motors (Halifax), Ltd.,** to employees at the Alexandra Hall, Halifax, recently a presentation was made to two members of the staff. Mr. R. Woodhead, who had completed fifty years' service, received a silver bowl and a cheque, and Mr. D. Teal, who had been with the company for twenty-five years, received a gold wrist watch.

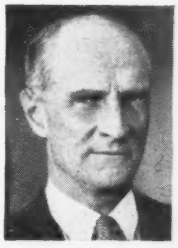
The Portland Players (B.E.A.) are presenting "Two Dozen Red Roses" (a three-act comedy) at the Portcullis Theatre, Westminster, on 4th and 5th November. Tickets are obtainable from the hon. secretary, The Library, Bankside House, Sumner Street, London, S.E.1.

The **G.E.C. Dramatic Society** has attained its silver jubilee; in the last twenty-five years it has presented fifty-four plays and raised over £3,000 for charities. This week the Society put on "Come Back Peter," by A. P. Dearsley, at the Fortune Theatre, London, W.C.2. This comedy of a family reunion in rather cramped quarters was well done and well received. Paula Kirkby and William Bulline, in the parts of the parents, Mary and William Hapgood, were hard-worked but untiring, and they were stoutly supported by Joan Morrison, Veronica Farrier, Barry Ramsay, Colin Hannay, Cedric Salomon, Frederick James, Ann Bell and Ian Stewart. The play was produced by Evelyn Watts.

OBITUARY

Mr. E. N. Bray.—The death occurred on 18th October of Mr. Edward Neville Bray, one of the founders of E. N. Bray, Ltd., who was in his eighty-third year. Mr. Bray joined Colonel Crompton as a pupil in 1889 and later spent a short period in Australia on the company's business. He then opened the Glasgow office and remained as manager until 1902. With two other Crompton pupils he founded, in 1903, Bray, Markham & Reiss, Ltd., and remained with that company until the retirement of his co-founders. Subsequently, in 1922, he formed a new company, E. N. Bray, Ltd., making a wider range of control gear. Until his retirement at the age of seventy-five he was actively engaged both as a designer and in the management of the business. Although after his retirement he ceased to take an active part in the company, he maintained a keen interest in its affairs, even to within a few hours of his death.

Mr. H. Nimmo.—Readers will learn with great regret of the death of Mr. Henry Nimmo, C.B.E., M.I.C.E., M.I.E.E., M.I.Mech.E., chairman of the Southern Electricity Board, on Monday last; he had been very ill for some time.



The late Mr. H. Nimmo

Mr. Nimmo was born at Cambusnethan, Lanarkshire, in 1885 and was educated at Airdrie Academy and Coatbridge Technical College. After engineering training with Shearer & Pettigrew and with Bruce Peebles & Co. he joined the British Westinghouse Co. as an erection engineer in 1906 and in the following year became chief electrical engineer to the Oakbank Oil Co.

Mr. Nimmo's long connection with Burma began in 1909 when he was appointed chief electrical engineer to the Irrawaddy Flotilla Co., Rangoon; he subsequently became assistant engineer to the Rangoon Electric Tramway & Supply Co. Then for about fifteen years from 1914 he was electrical adviser and chief electrical engineer to the Government of Burma, but during the first world war served in the London Electrical Engineers R.E. (T.), joining as a sapper and rising to captain.

From 1929 to 1945 he was chief inspecting engineer to the Electricity Commission; he became a Commissioner in 1945 and held that position until the nationalization of the electricity supply industry in 1948 when he was appointed chairman of the Southern Electricity Board. Concurrently with his work with the Electricity Commission Mr. Nimmo acted as electric power adviser to the War Office from 1936 to 1941. He was also chairman of the Isle of Man Hydro-Electric Commission.

Mr. Nimmo took part in many electrical activities. He was president of the Association of Supervising Electrical Engineers from 1946 to 1948, chairman of the British Electrical Development Association in 1952-53, a member of the E.R.A. Council, chairman of the Advisory Committee on Electrical Appliances and Accessories, a member of Council and vice-president of C.I.G.R.E. and a member of Council and chairman of the British National Committee of U.N.I.P.E.D.E.

We extend our sympathy to Mrs. Nimmo and their daughters.

Cremation took place privately this week. The Institution of Electrical Engineers (of which Mr. Nimmo was a past member of Council and former hon. treasurer), in conjunction with the Southern Electricity Board, has arranged a memorial service. This will take place at the Queen's Chapel of the Savoy, Savoy Street, W.C.2, at 12 noon on Thursday next, 4th November. The service will be conducted by the chaplain, the Rev. Cyril Cresswell, and the altar flowers will be provided by the members and staff of the Southern Electricity Board.

Mr. Theodore Stevens.—The death occurred on 18th October at Herne Bay Hospital, Kent, of Mr. Theodore Stevens, B.Met., Min.E. (Lehigh Univ.), M.I.C.E., M.I.E.E., F.Amer.I.E.E. Mr. Stevens, who was in his ninetieth year, was born at Louisville, Kentucky, and educated at the Germantown Academy, Dickinson College and Lehigh University, U.S.A. He practised in this country for many years as a consulting engineer and frequently contributed to the correspondence columns of the "Electrical Review." He was the first secretary of the Overhead Lines Association.

Mr. W. C. Stevens.—We regret to report the death on 23rd October of Mr. Walter C. Stevens, general secretary of the Electrical Trades Union, who had been badly injured in a car accident a few days earlier. Mr. Stevens was fifty years of age and had been general secretary of the E.T.U. since 1948. He was a working electrician until 1938 when he became London area secretary of the Union. He was assistant general secretary from 1942 to 1947.

Daily Herald photo

The late Mr. W. C. Stevens

Mr. F. G. Thomson.—The death occurred on 10th October, at the age of forty-six, of Mr. Frederick George Thomson, London lamp sales manager of the Stearn Electric Co., Ltd. Mr. Thomson joined the company in 1936, after ten years with Philips Electrical, Ltd. He was a specialist in projector and special lamps.

Mr. W. G. Hodgson, A.M.I.E.E., formerly managing director, W. G. Hodgson & Co., Ltd., died on 22nd October at the age of eighty-six.

WILLS

Mrs. Ellen Paul, widow of Mr. R. W. Paul, of 98, Victoria Drive, S.W.19, who died on 19th July, left £44,179 gross (£43,943 net). She left £3,000 to the Institution of Electrical Engineers to augment the "Paul Scholarship Fund," and £5,000 to the Royal Institution of Great Britain.

Mr. N. H. Miller, A.M.I.E.E., assistant liaison officer of British Insulated Callender's Cables, Ltd., who died on 29th January last, left estate "so far as can at present be ascertained" valued at £4,822 gross (£4,598 net).

Mr. H. Dixon, formerly manager, Central Sussex District, South Eastern Electricity Board, who died on 7th August, left £5,933 gross (£5,752 net).

PARLIAMENTARY REPORT

IN the House of Commons last week Mr. George Thomson and Mr. Bence asked the Secretary of State for Scotland what representations he had received respecting representation on the new South of Scotland Electricity Board.

Mr. J. Stuart said that the Scottish Council of the Electrical Association for Women had suggested that the point of view of women consumers of electricity should be represented by women on the new Board. He had replied that he would keep this view in mind in the event of the Electricity Reorganization (Scotland) Bill becoming law. No other general representations had been received.

Scottish Battery Locomotives?

Mr. Hector Hughes asked the Secretary of State if he would state the nature and result of his conversations which were directed towards using Scottish electricity to charge batteries for battery-run locomotives on Scottish railways; and when and where he expected such locomotives to be available for use on Scottish railways.

Mr. J. Stuart replied that he had had no such conversations. He understood, however, that the North of Scotland Hydro-Electric Board had raised the matter with the British Transport Commission and that further discussions were in view.

Cross-Channel Cables

On Wednesday Mr. E. L. Mallalieu asked the Assistant Postmaster-General what consultations he had had with the French telephone authorities about the possibility of having a gallery under the Channel for telephone and electric cables.

Mr. L. D. Gammans (Assistant Postmaster-General) replied: "None, sir."

Plant Maintenance

On Monday last Mr. Peter Roberts asked the Minister of Fuel and Power if he would give a general direction to the British Electricity Authority to abstain from establishing its own central workshops.

Mr. Joynson-Hicks, Parliamentary Secretary, Ministry of Fuel and Power, said he would not. The Authority must be in a position to provide immediate repair services and overhaul facilities, in particular for its generating plant, and experience had shown that costs could be reduced and delays avoided by providing groups of power stations with service from central workshops.

Electricity and Gas Publicity

Mr. H. Hynd asked the Minister of Fuel and Power whether he had noticed the big increase in expenditure on publicity by the Gas Council and the British Electricity Authority, as revealed in their accounts for the year ended 31st March last, and what statutory directions he had issued to them to exercise economy under this heading.

Mr. Joynson-Hicks said that some increase was to be expected following the removal last year of restrictions on advertising, but the Minister had continued to keep in close consultation with both industries and he was satisfied that they should themselves continue to have full responsibility in this matter.

Fuel Supplies

Mr. Geoffrey Lloyd, Minister of Fuel and Power, speaking on the annual report of the National Coal Board for 1953, said that last year coal consumption had shown a mild increase, but this year there had been a great upsurge, and this reflected the buoyant progress of industry. Electricity consumption on farms was up by 16 per cent and the rate of increase in the industrial consumption of electricity was three times greater than last year.

The Government's policy was to get more coal, to use it better, to supplement it with atomic energy as soon as possible, and to use oil at once, and natural gas if it could be found. The use of oil was expanding, and this year another two million tons of oil would be used, the equivalent of three million tons of coal. The new Marchwood power station at Southampton Water would burn oil which could be supplied there at the same price as coal, and the British Electricity Authority was considering the installation of dual-firing equipment in other stations which would eventually be consuming 10 million tons of coal on existing plans. As a first step, seven new stations would be so equipped. The Marchwood power station would begin to burn oil in the autumn of next year and the others in the autumn of 1956. That was good progress in a short time. The oil used in those stations would be the equivalent of about five million tons of coal a year.

The Minister also referred to the use of natural gas and said that the Americans had developed a method whereby the gas at present being wasted in the oilfields near the Gulf of Mexico could be transported, in a liquefied form, to the great consuming centres. Much work has been done on the technical features and the costings of bringing liquefied gas to this country in tankers from America or the Middle East. Preliminary estimates had shown that the cost per therm would be considerably lower than that of the present carbonization process.

In the course of the debate Mr. Nabarro said that the railways were burning nearly 14 million tons of large coal a year more wastefully than any other industrial undertaking.

Faraday House Dinner

THERE was a large gathering of members of the Faraday House Old Students' Association and a number of distinguished guests at the Savoy Hotel, London, on 22nd October, for the annual dinner under the chairmanship of Mr. E. L. Gethin, president of the Association. Mr. J. Eccles, president of the Institution of Electrical Engineers, proposed the toast "Faraday House" and said that this college had made its impact upon the times in which we lived and since its inception had turned out a steady stream of British and other engineers who had done credit to the college. Technology had vastly increased in complication of late and it was continuing to do so although man's ability to learn had not improved. Thus, teaching had to be simplified and Faraday House was endeavouring to meet this requirement.

In responding, Dr. W. R. C. Coode-Adams (principal) said that a steady increase of knowledge was the only thing worth working for, after which he discussed the function of Faraday House and the engineer in modern society. He also referred to the 50th anniversary of the thermionic valve, which was to be celebrated next month, and said that without this device many things which we now accepted as commonplace, would not have been possible.

The toast, "The Guests" was proposed by Mr. A. N. Irens, immediate past president F.H.O.S.A., the response being made by Mr. A. R. Cooper, controller, North West, Merseyside and North Wales Division of the B.E.A. Mr. J. W. Bailey proposed the toast, "The Chairman," and Mr. E. L. Gethin replied briefly.

Scottish Railway Electrification

A meeting was held in Glasgow last week of representatives of the Glasgow Corporation and the British Transport Commission to consider proposals for the electrification of some of the Glasgow suburban railways. As a result a "working party" is to be appointed to survey the particular transport problems relating to two large Corporation housing schemes.

TELECOMMUNICATION DEVELOPMENT

PROPOSING the toast of the "Telephone Industry" at the dinner of the Telecommunications, Engineering and Manufacturing Association at the May Fair Hotel, London, last week, Earl De La Warr, Postmaster General, said that the Post Office had doubled the number of telephones since the war. During the last nine years 1,600 new exchanges had been opened and another 200 were in course of construction. Nearly 7,000,000 miles of wire had been laid and nearly 3,000,000 telephones installed.

While Post Office engineers were installing telephones almost twice as fast as before the war there was to be a considerable speeding up of new telephone development. In 1949–50 £41 million was available for this purpose. This year it was £68 million, while next year it would be over £79 million. They intended to work all out to catch up with the arrears of the war years and the years of shortage that followed the war. Operators in London and 42 towns and cities could now dial direct into subscribers' homes and offices. With regard to the overseas telephone service Britain had in 1945 only 74 connecting links with the Continent: to-day there were nearly 460 circuits. The newly laid submarine cable between Aberdeen and Bergen, the longest in the world, would enable telephone calls to go direct to Norway. On 12th November a new factory of one of our largest cable manufacturers would be officially opened in this country for manufacturing a large part of the transatlantic submarine telephone cable. In the sphere of radiotelephony a very important extension of Rugby radio would be opened next year.

Earl De La Warr congratulated the industry on its contribution to export, over £100 million worth of telephone equipment having been sent abroad since the war in face of growing competition.

In reply Sir Thomas Spencer, chairman of Standard Telephones & Cables, Ltd., called for a co-ordination of Post Office and industrial research and development facilities in order to apply new discoveries as quickly as possible to the betterment of the telephone services to enable us to keep ahead of our competitors in the export field. Referring to support being given by foreign Governments to their industries he also asked the British Government to study the situation and give such assistance as was necessary to preserve British exports.

MANAGEMENT AND EUROPEAN PROSPERITY

THE contribution which management could make to European prosperity was the theme of a conference held last week-end by the British Institute of Management and attended by representatives of business concerns and public undertakings in Great Britain and Continental countries.

The essential characteristics of public enterprise were defined in a paper by Dr. H. Kaun, managing director of the Stuttgart public utilities. Among them, he said, was the absence of competition in the usual sense of the word, but that statement needed qualification: even among public undertakings there was some direct competition such as that between electricity and gas, or road and rail, or gas and oil.

But the concentration of ownership in the hands of a public authority obviously implied the lack of competition in a particular field and this had to be offset by other factors. Dr. Kaun thought that two things counterbalanced the relative lack of competition: first that services like electricity, gas, or water supply were particularly "close to the consumer" and so subject to very intimate criticism, and second that those responsible for these services had a duty to supply the best possible service to the public.

Among the methods of fostering the spirit of public service Dr. Kaun placed high the publication to the workers and the public of candid and comprehensive information about the financial and other conditions in which it was conducted.

Mr. Tom Williamson, general secretary of the National Union of General and Municipal Workers, spoke on the value of joint consultation in its bearing on productive efficiency. It was a fallacy all too common to suppose that the negotiation of wages and working conditions was the sole function of a trade union. It was equally concerned with broader issues affecting the welfare of the industry in which its members were employed. Joint consultation would not be a success until it became part of the everyday lives of work people in mines, factories, and workshops. To help in filling that gap the trade unions had embarked on a programme of education and training for their officers and members

Chelmsford Engineering Society

On 21st October Mr. C. A. Cameron Brown, agricultural electrification adviser, British Electricity Authority, gave a lecture to the Chelmsford Engineering Society entitled "Modern Developments in Agricultural Electrification."

Brit.I.R.E. Report

THE 28th annual report of the British Institution of Radio Engineers stresses the growing demand for radio and electronic engineers, particularly overseas. The number of university degrees in technology has fallen in the last two years, while the number of students completing their courses at technical colleges is insufficient to meet the present demand for engineers. Nevertheless, the Institution's graduateship examination continues to attract over 1,000 candidates a year, although "it is to be regretted that the efforts of these candidates continue to be so poorly rewarded." Less than 10 per cent of the number of entrants pass the graduateship examination. The difficulty of securing adequate technical training stresses the shortage of teachers in radio engineering and allied subjects and the corresponding inadequacy of training facilities.

During the year the Institution increased the number of section meetings. Fifty-three meetings were held in the United Kingdom and 42 meetings were held by sections in India, New Zealand and South Africa. This does not include the meetings held during this year's Industrial Electronics Convention at Oxford. Membership of the Institution had increased by a further 367 up to 31st March last, so that the present membership exceeds 5,000.

Cable Literature

A further addition to the booklets dealing with electric cables which have been recently published by the Cable Makers' Association is "Modern Rubber Cable Technology." This starts with a story of the development of the rubber industry from the discovery that by heating with sulphur natural rubber can be converted from a thermoplastic material into an elastic one, and from the appreciation that to get natural rubber into a usable form for its application to wire as insulation and protection sheathing it is necessary to masticate it on open rolls or in an enclosed mixer. Vulcanization and ageing and other tests are also dealt with, and the booklet concludes with a short treatise on synthetic rubber.

B.B.C. Contract

In connection with its plan for nation-wide coverage with the Home, Light and Third services by a chain of v.h.f. frequency-modulated broadcasting stations, the British Broadcasting Corporation has placed another important order with Marconi's Wireless Telegraph Co., Ltd., covering twenty-four combining units and twenty-four feeder changeover switches, with the associated interconnecting feeders. This comprises equipment for six three-programme stations.

Engineering Research

AS the subject of his presidential address to the Institution of Mechanical Engineers, Dr. R. W. Bailey chose research in mechanical engineering. First in importance, he said, was the staff and its quality, particularly in regard to ability to think ahead of current practice. Buildings and equipment were secondary. The research staff should aim at contributing to the engineering progress of the employing concern not merely by solving isolated problems but by seeing them in their engineering setting, remembering that an 80 or 90 per cent solution obtained expeditiously was often of more value, both immediately and to a later fuller understanding, than prolonged striving after a 100 per cent result. Training should be basically in mechanical engineering but with more than a usual knowledge of metallurgy.

Overall cost of research by individual engineering concerns was higher than by dependence on external associations. The first, which led to a more intimate contact with engineering, offered substantial advantages to larger firms and those engaged on special products or pioneering work and was likely to lead to more rapid utilization of results in current development. It might well be combined with assistance from external organizations in minor matters, leaving its own staff free to attend to those of more immediate importance, or in developments for which it had not expensive testing equipment to deal with some limited though vital application. Otherwise the natural field for outside aid would be for smaller firms with more limited technical resources, which would thus have the benefit of, in effect, subsidized research. Such firms would gain fullest benefit by making well qualified members of their staff responsible for keeping in touch with research associations and other sources of information. The final section of the address dealt with the shortage of able and well trained young men not necessarily destined for the highest technological leadership. A contribution to remedying the deficiency would be careful selection of craftsmen apprentices able and willing to undergo training for higher positions, but avoiding the wastage that would follow indiscriminate admission.

Supervisory Duties

THE two aspects of a consulting engineer's work—advisory and supervisory—were discussed by Mr. S. B. Donkin (Kennedy & Donkin) in his presidential address to the Association of Supervising Electrical Engineers. A client who accepted a consultant's recommendations, he stated, often asked him to supervise the carrying out of the work with a view to ensuring that it was done properly, promptly and economically, with a small degree of priority in that order.

Mr. Donkin illustrated his remarks by reference to four installations. The first related to 132 kV substations for the B.E.A., the chief points being the desirability of doing civil engineering work during the summer and the testing of multi-core cables, preferably by passing heavy currents at low voltage through the primary connections and busbars of the substation to prove their correctness. The installation of air-blast circuit breakers and gas-pressure cables called for mechanical engineering experience as regarded air compressors, pneumatic relays and the making of gas-tight joints on compressed-air pipe lines and reservoirs. In normally unattended substations periodic routine tests should be made of relays and control gear, which were normally idle but when required must instantly operate with complete reliability.

The next illustration was the supervision of a thermal-storage industrial power station supplying electricity and steam. As the demands for both varied throughout the day and with the seasons, surpluses had to be absorbed. The simplest way was by running back-pressure plant in parallel with the grid, but the difference between buying and selling prices of the interchanged electricity had to be small to secure economy. For independent operation balance between the two services could be obtained by: passing excess steam to an accumulator; using condensing sets; taking make-up steam from pressure-reducing valves; altering pressure in low-pressure steam mains; and ripple control of non-essential electric or steam loads.

The third case taken was the Pimlico district heating scheme of which particulars have previously been given in the *Electrical Review*. The work of the control engineer and the use of mixing valves to maintain equality of minimum temperature (at 65 deg F in the sitting room) as between different flats were described as was also the function of the hot-water accumulator in association with the back-pressure turbo-alternators in Battersea power station.

The final case considered was the Owen Falls hydro-electric station, Uganda, which now contained two 15 MW turbo-alternators out of its ultimate capacity of 150 MW. The principal matters dealt with were possible damage to porcelain insulators by unskilled native labour, the avoidance of hygroscopic insulation in view of high humidity and the need for care in packaging component parts to avoid damage in transport, especially in regard to salt-laden atmospheres. An instance of foresight commended related to the despatch of control panels completely enclosed in polythene bags containing linen bags filled with silica gel; the panels were rigidly supported in good packing cases and arrived in perfect condition.

Lighting Engineers' Troubles

MR. G. W. A. ILLINGWORTH, public lighting engineer, Southport, who was inducted chairman of Liverpool Centre of the Illuminating Engineering Society on 19th October, gave an address on " Street Lighting Equipment and the User."

He said the real critical test period of new equipment was when it was in the hands of men only interested in the amount of work necessary to keep it clean.

The chairman pointed to many of the " snags " in maintenance work in connection with street lighting, an example being the failure to paint fully the lugs of bowl type fittings. The screw or spring catch could be a great source of trouble from corrosion too. Bracketed separate reflectors or refractors were most unkind to cold wet fingers and if there was a way to replace them out of position it was certain that sooner or later that would happen.

The sodium lamp was difficult to maintain. It was too heavy owing to the large porcelain caps on the lamp and tube; it could come apart if the pin catch was faulty, and could so easily be broken as the pinch was loosely held between fairly strong porcelain jaws.

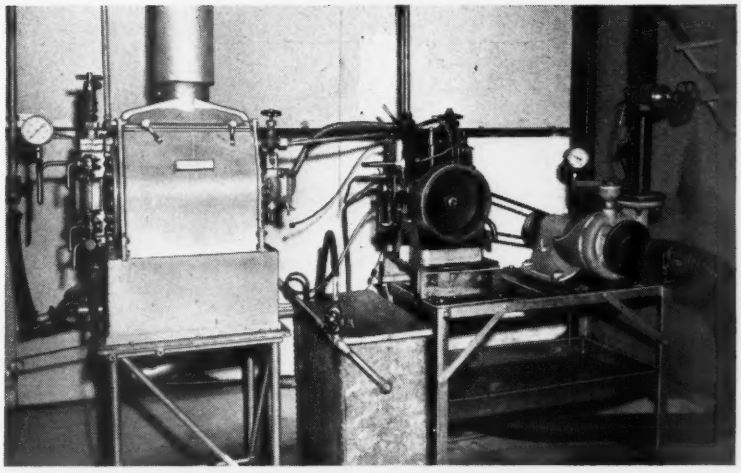
Graphical Symbols

IN circuit diagrams " power " engineers have employed the symbols given in the 1951 edition of B.S. 108 (Graphical Symbols for General Electrical Purposes), while telecommunication users have consulted the 1950 Supplement to B.S. 530. Each standard reflected the conventions that had grown up in the field of technology concerned and in consequence there were some inconsistencies between them. For instance, a capacitor was " Cp " in B.S. 108 and " C " in B.S. 530, " C " being a contactor in the former. In power diagrams " TR " indicated a tripping relay, but in telecommunication diagrams it indicated a transformer.

As a result of discussions these differences have now been removed; the simultaneous issue of amendments PD 1952 (to B.S. 108) and PD 1953 (to the Supplement to B.S. 530) show the extent to which the two classes of users have met half-way. As examples, a capacitor is now " C " to all users, a contactor being " Con "; " TR " remains tripping relay, the transformer of B.S. 530 having become " T " to conform to B.S. 108. Copies of the two amendments can be obtained free of charge from the British Standards Institution, 2, Park Street, London, W.1.

Steam-Operated Prime Mover

Equipment for Use in Undeveloped Countries



The prime mover, with steam raiser on the left, driving a medium head pump

A RESEARCH and development programme for a small steam-operated prime mover for use in undeveloped countries where no indigenous resources of liquid fuel exist has for some time been sponsored by the National Research Development Corporation. The design and production of experimental equipment was undertaken by Ricardo (1927), Ltd., under the leadership of Sir Harry Ricardo, and work has also been continuing at the Sondes Place Research Institute, Dorking, under the supervision of Brigadier M. H. Cox, who is well known in connection with the Sindri fertilizer plant in India. This prime mover, now in the form of a " pre-production prototype," operates on low grade coal, lignite, peat, wood, combustible farm and industrial waste, brushwood or jungle grass. When we visited Sondes Place Research Institute last week the N.R.D.C. demonstrated several of these engines working in various operational roles, including pumping, irrigation, spraying, corn milling, wood sawing, power generation for a workshop and a complete power unit for a tropical bungalow.

Three Units

The prime mover consists of three units which can be transported separately and easily assembled on site. These three units are the furnace, steam generator and engine. The furnace is simple and capable of being made of materials easily obtained in all countries. Although a furnace of standard size can be used to deal with all types of fuel, in practice it is preferable to have a small and compact form for use where the fuel is coal, peat or wood; a somewhat larger furnace with a bigger grate area is better for burning such agricultural wastes as sugar-cane trash, cotton stalks, etc.

The steam generator is essentially a cylindrical drum with deep external ribs, end covers secured by studs, and suitable cowling. The drum is a light non-corrosive alloy casting and the deep ribs give strength and efficient heat transfer from the hot flue gases which circulate round it. Water is supplied by an engine-driven pump and the level is kept constant by a float which, in addition to controlling the action of the feed water inlet valve, incorporates a low-water-level safety device. A simple superheater is incorporated below the chimney to ensure that the steam received by the engine is dry. The cubic capacity of the prototype steam generators is about $2\frac{1}{2}$ gal.

The prototype engines are of the vertical, twin-cylinder, uniflow type, covered by patents, with a special valve arrangement to ensure economy of steam consumption (30 lb/b.h.p.-hr). The prototypes develop a continuous output of $2\frac{1}{2}$ b.h.p. at 1,250 r.p.m. when supplied with steam at 150 lb/sq in. Capacity for overload is considerable and an output as high as 3·5 h.p. can safely be obtained intermittently. For many purposes a larger model of the engine will be required, but no difficulty is anticipated in scaling up to say 5 h.p. continuous rating.

The furnace, steam generator and engine are coupled together to form the complete prime mover. This can be fixed on various types of mounting, including a simple trailer, and is easily transportable. A steam prime mover has certain advantages over an i.c. engine. It has a large overload capacity and will not stall. When the load is reduced, the engine restarts.

NEW BOOKS

Problems in Electrical Engineering. By S. Parker Smith, C.B.E., D.Sc., M.I.E.E., A.M.I.C.E. Sixth edition, edited by N. N. Parker Smith. Pp. 342, + xvii. Constable & Co., Ltd., 12, Orange Street, London, W.C.2. Price 18s.

This book has been a boon to lecturer and student in the past, and it now arrives in its sixth edition as an even greater help in the transition period of c.g.s. to m.k.s. The questions are now all phrased (where necessary) in *both* systems, answers being also given in both.

This has meant considerable revision, and the book has benefited by additions to certain sections and also an extra chapter. The total number of problems is now 1,879, covering almost all conceivable aspects of electrical engineering. The additions appear mostly in instruments, electron characteristics and a new chapter on automatic control systems. The introductory chapter deals concisely and well with the appreciation and use of m.k.s. units, and there is a table of comparative sizes. In the light of the general adoption of this system by the I.E.E. and up-to-date colleges, it is fitting that the late author should have been early in the field of revisers. A *most* useful book.—E.H.S.

Radio Valve Data: Characteristics of 2,000 Valves & C.R. Tubes. Compiled by the staff of *Wireless World*. Fourth Edition. Pp. 100. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 3s 6d (postage 4d).

The latest edition of this widely-used reference book contains full operating data on over 2,000 types of British and American radio valves and some 200 cathode-ray tubes. Seventeen British valve manufacturers are represented, all of whom have co-operated with *Wireless World* in ensuring that the information given is accurate, comprehensive and up-to-date.

The main tables give the electrical characteristics of each valve, and separate tables show their base connections. The main tables further classify the valves into current, replacement or obsolete types, as recommended by the makers. An index enables any valve to be found in the tables immediately, while a valuable new feature is a full list of equivalents.

OVERSEAS ELECTRICAL TRADE

Little Change in Overall Export Position

LAST month, as in August, British exports of electrical equipment continued at a level very close to that of last year. Thus the September total of £12·5 million compares with £12·4 million in August, while for last year the corresponding values were £12·3 million and £12·5 million respectively. These figures are lower than the monthly average, reflecting the influence of the holiday season. For the nine months of the year to the end of September the value of British electrical exports was £129·4 million, an advance of £1·4 million on the total for the first three quarters of 1953. This gain, unfortunately, is almost certain to be lost this month as a result of the dock strike although it may be recovered before the end of the year.

Exports of generating plant and motors, at £2,018,619, were below the August figure (£2,414,070). The chief markets were: India, £196,950; Spain, £194,728; the Soviet Union, £183,504; South Africa, £167,089; and Australia, £154,148. The trade in other types of electrical machinery—transformers, convertors, switchgear, etc.—showed hardly any change at £1,883,117. Purchases of radio and electronic apparatus advanced from £1,978,924 in August to £2,184,463 last month, Canada being the most important buyer (£194,078). Exports of telegraph and telephone equipment fell from £1,035,065 to £937,120, while those of cables and wires, £1,272,653, remained at the August level. Table I covers the exports included in the electrical section of the official returns, their destinations being analysed in Table II. Among equipment classified under other headings are the following:—Electrically operated washing machines and parts, £402,211 in September, making the total for the nine months £3,925,233, an increase of just over a million pounds on the corresponding period of 1953; welding electrodes, £92,205, making £810,027 (£1,044,739); electric conduit tubes and cased tubes, £73,962, making £616,193 (£711,352); electric locomotives, £179,352, making £1,720,611 (£2,497,558); and diesel-electric locomotives, £383,815, raising the total to £2,864,907 (£480,254).

Imports of electrical equipment last month rose in value to £1,393,772 from the August figure of £1,135,171, making the substantial total of £11,860,920 for the first nine months of the year (against £6,893,049 in January–September, 1953). The largest increases compared with the first nine months of last year have been in magnetos and electrical

TABLE I.—ELECTRICAL EXPORTS

Class	Sept., 1954	Nine months ended 30th Sept.	
		1953	1954
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW	82,314	748,374	894,511
Ditto, 10 to 65 kW	117,185	1,311,272	1,427,568
Ditto, 65 to 200 kW	49,340	771,415	765,559
Ditto, over 200 kW	312,466	1,325,938	3,100,385
Spark ignition engine driven	9,352	213,608	150,926
Steam turbine driven	18,978	1,597,589	631,456
Other prime mover driven	73,112	453,621	792,568
Generators	136,136	2,185,766	1,783,168
Parts of generators	319,396	4,362,684	3,560,679
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ¼ h.p.	167,259	1,084,525	1,617,878
Over ¼ h.p. but under 1 h.p.	51,315	305,314	447,626
1 h.p. to 250 h.p.	372,761	3,505,531	3,487,930
Over 250 h.p.	64,383	711,487	1,138,294
Railway, tramway and trolley-bus motors complete and parts of all motors	87,415	1,632,244	1,259,070
Motor starting and controlling gear	157,207	2,039,502	1,738,989
Converting machinery	24,649	364,224	249,137
Mercury-arc rectifiers	59,346	453,989	448,879
Transformers for lighting, heating and power (incl. coils)	722,404	8,975,469	8,822,315
Switchgear and switchboards (not telegraph or telephone)	1,076,718	12,057,511	11,629,194
Primary batteries:			
Lighting	69,804	531,826	603,467
Radio	146,219	745,690	1,325,519
Other	48,764	393,893	409,586
Parts (excl. carbons)	35,952	206,660	457,332
Lamps:			
Filament, exceeding 24 V	74,540	578,284	697,975
Ditto, under 24 V	36,776	196,253	275,791
Discharge lamps, fluorescent tubes, etc.	61,997	361,226	539,087
Other lamps	22,749	135,759	213,723
Radio and television, etc, apparatus:			
Cathode-ray tubes	31,037	119,426	104,746
Other valves (not X-ray)	173,253	1,504,048	1,485,290
Radio and television transmitters	14,567	615,832	470,760
Commercial radio and radar equipment	1,045,923	6,887,405	9,199,424
Domestic radio receivers, mains	156,614	1,738,426	1,473,224
Ditto, battery	51,561	417,004	509,760
Ditto, other (incl. car)	27,158	121,261	123,637
Radiograms	30,766	374,152	333,501
Television sets	60,406	246,554	249,935
Public address equipment	52,469	423,977	526,227
Sound reproducing app., n.e.s.	23,764	132,967	212,579
Components and parts, n.e.s., incl. parts of valves and c.r. tubes	516,945	3,772,104	5,009,706
Telegraph and telephone installations	408,675	3,898,976	5,152,983
Telephone instruments, separately consigned	75,938	1,408,423	956,650
Telegraph and telephone parts	361,062	5,568,337	4,141,152
Line apparatus for long distance commun.	91,445	1,644,537	1,258,492
Cookers	102,076	394,087	705,121
Toasters	27,513	138,908	174,268
Other cooking apparatus	39,061	176,341	309,726
Parts and accessories	41,197	250,631	376,841
Space heating appliances	32,367	167,054	301,764
Water heating appliances	16,378	225,157	220,373
Other heating appliances	27,160	221,350	293,584
Parts and accessories	42,192	379,213	426,976
Irons	67,224	435,276	542,925
Arc welding equipment, a.c.	24,663	420,691	306,751
Ditto, d.c.	32,592	336,489	435,415
Resistance welding equipment	12,923	92,553	152,606
Magnetos, ignition	17,791	180,138	136,347
Sparking plugs	135,568	1,020,650	1,293,374
Elec. appliances for aeroplanes, n.e.s.	182,999	1,318,243	1,661,710
Ditto, for motor vehicles, n.e.s.	247,061	1,519,680	2,139,560
Ditto, for cycles, n.e.s.	74,673	547,410	718,933
Signalling app. (incl. traffic signals)	24,826	577,477	470,511
Industrial radio-frequency equipment	38,531	117,973	194,297
Bell app. (not telegraphic or telephonic)	9,144	63,157	74,215
Instruments, commercial	163,259	1,219,377	1,329,330
House service meters (not prepayment)	95,557	706,491	1,055,036
Ditto, prepayment	11,473	84,303	131,422
Electro-medical apparatus (not X-ray)	38,332	334,018	400,888
X-ray apparatus (excl. tubes and valves)	52,430	533,745	443,064
Vacuum tubes	15,357	192,561	168,769
Desk fans	34,894	276,257	303,864
Ceiling fans	160,970	870,259	838,844
Vacuum cleaners	50,518	1,126,296	1,562,880
Floor polishers	89,128	554,312	933,342
Food mixers	58,126	366,564	440,621
Hair clippers and dry shavers	116,420	343,364	790,414
Other portable appliances	26,223	155,890	237,502
Parts	66,669	384,144	660,068
Portable elec. tools (not saws) and parts	151,543	1,208,925	1,411,657
Cables and wires:			
Telegraph and telephone, submarine	5,428	746,225	598,187
Ditto, other	237,957	6,150,548	2,936,299
Cotton, silk or art. silk insulated	33,640	517,181	334,069
Enamel, glass or asbestos insulated	60,266	778,731	631,972
Paper insulated	394,447	8,555,733	4,668,141
Rubber insulated	358,175	3,877,115	3,588,864
Other	182,740	2,524,599	2,096,205
Accumulators for motor vehicles	128,199	1,285,924	1,403,385
Ditto, traction	29,759	148,646	217,485
Ditto, radio and other portable	45,579	376,553	326,009
Ditto, other	45,404	430,970	482,717
Parts and accessories	46,671	426,803	533,476
Elec. porcelain, etc. (incl. insulators)	48,730	703,770	742,800
Insulating cloth and tape	50,836	365,990	444,746
Other insulating material	58,622	533,639	654,443
Permanent magnets	26,161	271,318	355,479
Radio, telegraph and telephone testing equipment, n.e.s.	22,545	229,237	268,525
Scientific elec. instruments (not telegraphic or telephonic)	234,243	1,346,725	1,923,358
Electrical machinery, n.e.s.	228,208	698,662	1,222,856
Electrical apparatus and appliances, n.e.s.	434,781	4,926,954	4,616,495
TOTAL	12,519,349	127,957,440	129,370,192

TABLE II.—DISTRIBUTION OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	Sept., 1954	Nine months ended 30th Sept.	
		1953	1954
	£	£	£
Channel Islands	47,064	363,014	486,856
Gibraltar	14,229	149,959	86,369
Malta and Gozo	85,006	218,818	430,668
Cyprus	49,757	394,183	539,384
Sierra Leone	6,604	243,265	225,999
Gold Coast	59,286	922,449	1,004,954
Nigeria	149,339	1,701,312	1,370,854
Union of South Africa	1,219,920	15,584,624	13,718,790
Northern Rhodesia	149,051	1,049,249	1,084,555
Southern Rhodesia	127,582	1,988,668	1,796,246
Tanganyika	36,397	474,711	547,315
Kenya	117,671	1,904,691	1,282,592
Uganda	21,757	713,453	528,706
Nyasaland	7,143	115,881	89,143
Mauritius	6,939	230,352	184,680
Aden	30,680	1,370,609	722,469
Bahrain, Qatar and Trucial Oman	54,280	859,346	1,042,708
Kuwait	56,119	1,327,825	1,096,133
India	1,217,319	14,065,200	11,808,491
Pakistan	323,580	1,351,816	4,138,564
Singapore	220,209	2,294,625	2,390,758
Federation of Malaya	174,718	2,282,559	1,995,467
Ceylon	83,344	1,345,272	1,077,161
British North Borneo	64,353	275,512	337,467
Hong Kong	88,265	1,593,105	1,412,673
Australia	1,418,650	13,345,852	13,131,484
New Zealand	706,636	6,691,404	7,317,187
Canada	586,642	6,673,232	5,477,694
Jamaica	55,511	545,541	570,550
Barbados	16,615	121,537	184,024
Trinidad	77,016	625,661	722,691
British Guiana	28,642	251,289	314,092
Anglo-Egyptian Sudan	73,500	934,897	864,917
Other Commonwealth countries	134,539	1,112,314	1,088,632
Irish Republic	237,459	2,562,097	2,419,086
Soviet Union	205,947	225,262	1,775,776
Finland	80,853	607,759	993,873
Sweden	295,096	2,942,234	3,154,092
Norway	212,124	2,124,273	2,240,451
Iceland	23,592	157,395	133,497
Denmark	124,926	900,889	1,512,581
Poland	12,218	896,606	547,110
Western Germany	108,549	719,356	1,087,047
Netherlands	443,939	3,601,784	4,751,813
Belgium	227,472	2,396,807	2,266,977
France	181,203	2,068,405	2,398,495
Switzerland	70,111	651,428	791,503
Portugal	125,867	1,102,161	1,751,571
Spain	324,969	2,182,588	2,262,114
Italy	184,586	1,621,987	2,076,290
Austria	24,331	441,630	524,776
Czechoslovakia	134	46,603	30,236
Yugoslavia	31,797	476,077	833,522
Greece	83,588	721,655	661,669
Roumania	—	1,075,841	14,942
Turkey	63,327	956,025	455,698
Netherlands Antilles	7,929	114,982	61,523
Belgian Congo	10,499	291,705	247,945
French Morocco	25,809	201,025	217,203
Angola	11,072	92,499	89,005
Portuguese East Africa	15,041	183,086	202,703
Syria	26,624	205,989	244,054
Lebanon	27,556	309,035	299,101
Israel	29,002	469,554	290,698
Jordan	13,356	202,992	182,917
Egypt	109,609	967,284	860,022
Libya	4,477	177,808	75,964
Saudi Arabia	48,086	373,468	487,973
Iraq	173,705	1,829,834	2,037,902
Iran	28,408	162,894	306,523
Burma	143,374	928,056	1,219,547
Thailand	178,744	1,229,556	1,495,489
Indonesia	30,415	608,414	380,690
Japan	273,869	452,695	558,688
United States of America	143,114	1,714,788	2,118,825
Cuba	8,189	153,031	161,020
Mexico	26,927	265,891	250,392
Colombia	149,873	460,806	766,002
Venezuela	142,898	1,366,918	1,334,170
Peru	33,646	312,267	280,499
Chile	30,238	302,940	241,061
Brazil	14,322	1,044,654	630,927
Uruguay	49,251	205,292	638,535
Argentine Republic	40,643	514,488	692,401
Other foreign countries	112,222	1,213,402	1,245,021
TOTAL	12,519,349	127,957,440	129,370,192

appliances for aeroplanes, motor vehicles and cycles, from £269,562 to £1,000,461; cathode ray tubes, from £587,254 to £1,404,510; electronic valves, from £574,712 to £1,191,824; generators and parts, from £317,744 to £691,814; and unspecified machinery and apparatus, from £1,490,496 to £2,481,988. Nearly 30 per cent of the electrical imports have come from the Netherlands—£3,529,698 (against £1,828,353 in January–September, 1953). The second largest supplier was the United States, with £2,085,511 (against £1,545,584), followed by Canada, £1,518,420 (£271,807) and Western Germany, £1,289,386 (£880,671).

THE MOTOR SHOW

A Review of Electrical Developments

WITH nearly three hundred cars to see—about forty of them new models—it requires a good deal of determination and will-power to drag oneself away from the main display area on the ground floor of Earls Court where the thirty-ninth International Motor Exhibition is now being held. It is, however, on the side stands and in the gallery that the principal items of electrical interest are to be discovered, though of course it is true that some of the new electrical components have already found their way into production models.

Quite a few of the exhibits were on view at last month's Commercial Motor Show, so we propose to confine our remarks mainly to new features of the displays. In view of the coming into force of the Road Transport Lighting Act, 1953, at the beginning of this month, special attention has been paid to the rear illumination of vehicles. Lucas have a novel representation of the rear of a car fitted with the latest type of reflectors and broad beam reverse lamps, illuminated signs flashing such captions as "Good Number Plate Illumination," "Bold Twin Tail Lamps," etc. Flashing direction indicator sets are also on view on this stand, together with the new Lucas "Twin lamps" (a pair of lamps less than 6in in diameter for providing both a long range beam and a wide spread flat topped beam for fog), headlamp conversion sets for double dipping, special long range driving lamps, foglamps, defrosters and demisters, a new windscreen wiper, diesel engine starters, magnetos, coil ignition equipment, horns and batteries.

A new flashing indicator to replace existing types of semaphore trafficators is introduced by Belling & Lee, Ltd. It is readily seen both by the driver and other road users and needs no extra holes, wiring or switches. Also demonstrated on this stand are the "Save-a-Life" work and warning light and the "Sparkmaster," which is claimed to improve engine performance, reduce burning of the plug points, give better starting in cold weather and suppress television interference. Flashing light signals are also shown by Trico-Folberth, Ltd., with such other accessories as interior fans, windscreen wipers, and cigarette lighters.

A new Ceag "Lumax" long range driving lamp with a concentrated pencil beam of 1,000–1,200ft is available in 6, 12 and 24 V types and has successfully withstood exhaustive temperature and vibration tests. Marchal Distributors, Ltd., draw special attention to their fog and driving lamps,

Above : Runbaken electronic echo armature and field tester

Left : Crypton "Autovisor" engine testing apparatus for the smaller garage

which include flush fitting headlamps. A new Clayton Dewandre heating and demisting unit for the larger cars delivers 100 cu ft of heated air a minute, or more with high speeds. Among C.A.V. electrical equipment are totally enclosed generators for marine duty, starters of the axial and solenoid operated types, control boards for charging and lighting equipment, and heavy duty batteries.

Car radio receivers include a new Ekco range designed for any make of car, an ingenious permeability tuning system employed allowing instantaneous selection of three pre-set stations or manual tuning on medium and long waves. Besides a new three unit car radio Pye, Ltd., show a range of mobile and small fixed station v.h.f. radio telephones specially suitable for use in private cars.

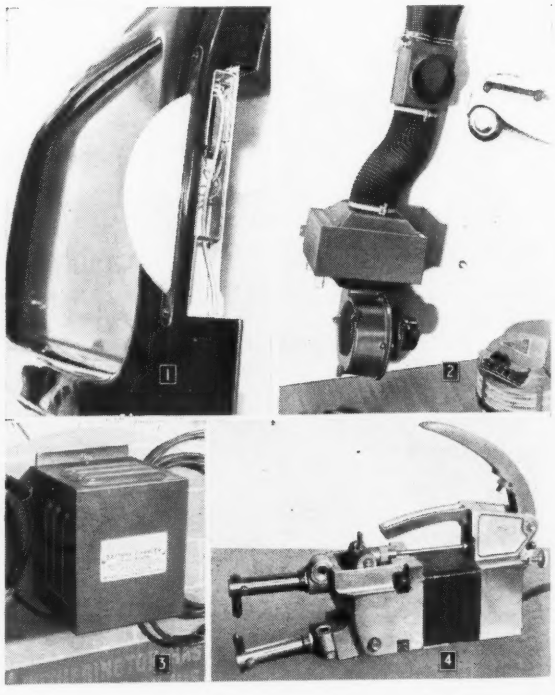
A good deal of development has occurred in the battery industry. Some of the more popular sizes of "Silver Exide" starter batteries have been re-designed with flush tops, the conventional inter-cell connectors being replaced by short links bridging the inter-cell partitions and lying flush with the lids. Besides improving the appearance, this innovation has considerably reduced weight and bulk. A novel form of gasket sealing between the terminal posts and the cell lids provides a permanently acid-tight and vibration-proof joint. These new types incorporate the three major features of the "Silver Exide" design—"Porvic" separators, grids with improved active materials and hard rubber containers. Special attention is drawn on the Peto & Radford stand to the "Dual-Life" range, a feature of which is the "Porvic" envelope enclosing each negative plate. Incorporated in the Crompton batteries are grids made from "Nilcrode" alloy permitting an extremely rigid framework to obviate distortion and also a special active material giving increased power from cold starting. The new Oldham "Major" batteries which are assembled in hard rubber containers with "Fibrak" separators in combination with fibre-glass retainer mats are factory charged and have an unlimited shelf life.

Apart from a selection from four ranges of batteries suitable for cars and light passenger vehicles, the "Ediswan" exhibit includes a new 5A "Tungar" charger for home or commercial use. The Westinghouse Brake & Signal Co. shows a new range of "Westalite" chargers with outputs from 12 to 2,400 W and a "Westric" home charger.

A combined battery booster, engine starter and a slow charger is introduced by Runbaken Electrical Products, who also exhibit an instrument for indicating volts and amperes simultaneously, the "Ardwick" set for testing ignition coils and condensers in situ and a new electronic echo testing set for armatures and coils.

Another new testing equipment specially designed for the smaller garage is the Crypton "Autovisor" set. Extremely compact, it deals comprehensively with all the main engine and electrical faults. Various other instruments in a new series of portable units include volt-ampere testers, coil testers, "Tach-Dwell" testers, exhaust gas analysers, "Vac-fuel" pump testers and condenser testers. An improved "BX.300" self-contained motor analyser incorporates new standards of simplicity and performance accuracy: only one test lead is needed and an entire engine can be tested in only ten sequence test operations. Also in the Crypton display are "Portostart" engine starters, fast chargers, metal and valve rectifiers, constant potential charging equipment and a new home charger.

A new welding gun demonstrated by the A.R.O. Machinery Co., Ltd., weighs only 18 lb and has almost the same performance as the larger models of which it is a development though of course the number of spots per hour obtainable is smaller. A new twin spot production welding gun can deal with work up to 14 s.w.g. + 8 s.w.g. mild steel by single sided approach only, i.e. the gun is applied to one side only of the two sheets to be welded.

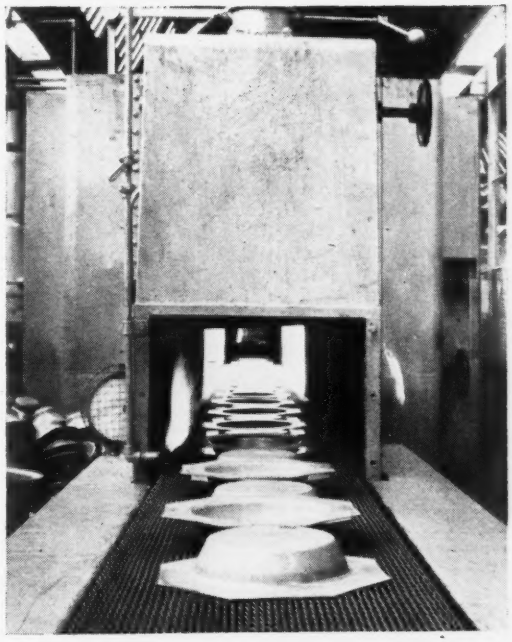


(1) Belling & Lee flashing turning indicator. (2) Clayton Dewandre car heater. (3) Westinghouse home charger. (4) A.R.O. welding gun weighing only 18 lb

Corrosion Resistant Furnace Belt

A CONVEYOR belt furnace for the continuous annealing of pressings in the Burnley works of Joseph Lucas (Gas Turbine Equipment), Ltd., is in operation for twenty-four hours per day for six days a week, mainly for annealing cold-worked pressings of Nimonic 75, prior to further working of the pressings. For about 5 per cent of the time, however, it operates at 700 deg C, annealing mild steel pressings. The pressings are carried on the conveyor at about one foot centres and they weigh an average of about 3 lb each. About 222 pressings pass through the furnace every three hours, giving an average production of 2,664 pressings per day.

With this rate of travel and an annealing temperature of 1,040 deg C for the Nimonic 75 work, it is apparent that the material from which the belt is woven must have good resistance to oxidation and scaling, and must retain its strength at high temperatures in order to avoid stretch which, besides causing delay while the belt is being adjusted, gives rise to unevenness and unequal distribution of stress across the belt. The belt is constructed of Nimonic DS, a nickel-chromium-iron alloy containing nickel 37, chromium 18 and silicon 2 per cent with balance iron, a composition which was developed especially for this type of service. In this particular instance the atmosphere used is partially burnt town's gas. Nimonic DS is the most resistant of the Wiggin heat-resisting materials against the corrosive attack of this type of atmosphere and also "green rot." From the following list of physical properties it will be seen that thermal conductivity is fairly high, while expansion figures are near those for mild steel, a factor which enables Nimonic DS to be used without the need to make allowances for differential expansion. The furnace, which was supplied by Birlec, Ltd., has been in operation for nine years, and the average life obtained with each Nimonic DS belt is nine months.



This Birlec continuous annealing furnace uses a belt of the alloy Nimonic D.S. for conveying Nimonic 75 pressings through the heating chamber

The following are some of the more important physical properties of Nimonic DS: specific gravity, 7·97; melting range, 1,320–1,350 deg C; thermal conductivity in c.g.s. units at 100 deg C, 0·034; at 900 deg C, 0·075; mean coefficient of thermal expansion in millionths per deg C, at 20–100 deg C, 14·2; 20–200 deg C, 15·4; 20–300 deg C, 16·1; 20–400 deg C, 16·5; 20–500 deg C, 16·9; 20–600 deg C, 17·4; 20–700 deg C, 17·7; 20–800 deg C, 18·5; and 20–900 deg C, 19·3. The electrical resistivity in microhms/cm/sq cm at 20 deg C is 108.

System Operation in Sydney

A NUMBER of technical developments are recorded in the annual report of Mr. C. E. Ranger, general manager of the Sydney (N.S.W.) County Council. Four of the new distribution centres commissioned in 1953 incorporate a single circuit breaker form of control and protection. This arrangement was developed by Council's engineers and represents a considerable capital saving in building and equipment. The application of this switching arrangement is limited to centres installed on a ring main system where pilot cables are available for protection purposes. A "unit" type of substation incorporating the single circuit breaker principle and suitable for outdoor use was developed and a contract was entered into for the supply and delivery of fifty such substations. These will be completely equipped with the exception of transformers and will be delivered over a period of four years.

A short circuit and heavy current testing station for testing the rupturing capacity of circuit breakers and the performance of fuses has been completed within the area of Blackwattle Bay substation and was commissioned early this year. New equipment developed and used in connection with new operation techniques included an impulse magnetizer, a relay spring torque tester and a live switchgear tester. Investigation of frequency injection equipment for the remote control of consumers' loading and street lighting was continued, and surveys of the concentration of water heating loads at certain distribution centres was carried out. Electronic and photo-electric methods of meter testing were investigated with a view to improving metering techniques and effecting economies in metering maintenance. New techniques in the application of statistical analysis to investigation work and the field performance of meters were introduced. A new branch established during the year is responsible for planning the development of the primary and secondary high voltage networks and the system generally and completing the city d.c./a.c. conversion scheme.

Additional generating plant put into service by the Electricity Commission of New South Wales made it possible for all restrictions on the use of electricity, with the exception of those applying to arc furnaces, to be removed, and the total maximum demand of the Sydney County Council's system reached 62,700 kVA, compared with 48,350 kVA in 1952.

Sales of electricity to the public totalled 1,292 million kWh, an increase of 13 per cent. Income from the sale of electricity amounted to £15·6 million, an increase of £2·3 million, part of which was attributable to higher tariffs. The overall average price received per kWh sold was 2·904d compared with 2·811d in 1952. There was a surplus on the year's operation of £579,950, reducing the accumulated deficit to £1,104,637.

Financial Section

STOCKS and SHARES

THE behaviour of Stock Exchange markets throughout most of October can scarcely be regarded as anything but impressive. Labour troubles and other uncertainties provided every justification for a major reaction in security prices, had there been any tendency in that direction. At no time did they, in fact, upset confidence at all seriously, and towards the end of the month prices were going ahead with vigour. At the beginning of the present week, a hesitating disposition became manifest, on account, largely, of disappointment that the dock strike remained unsettled. Most people have it in the back of their minds that sooner or later the curve must bend downwards: but few seem to find at the moment reasons nearer, or more definite, than a General Election for apprehending trouble ahead.

Further Advances

In the latest advance of prices in the industrial market, it was again a case of the big battalions leading the way. G.E.C. changed hands only a little below £3 (the official quotation being raised 5s to that figure). Westinghouse Brakes show a comparable gain at 81s 3d. A.E.I. rose by 3s 9d, English Electrics by 1s 9d and I.C.I. by 2s. Gains of 1s or more were recorded in Crompton Parkinsons, B.I.C.C., Henleys, Siemens, Chloride Electrics, Hoovers and Hackbridge & Hewittic. Radio shares came back into popularity. Plessey put on 4s 6d, to 57s; Cossors, Deccas, Thorn Electrical and Ever Ready are amongst others that improved. E. K. Cole, quoted ex capital bonus, are 19s for the old: the new shares are at about the same price.

Motor Accessories

Reflecting the evidence of high activity in the motor industry, shares in the companies supplying electrical and other car accessories have been among this year's outstandingly popular and profitable investments. Further large improvements occurred in prices during the Motor Show. Two of the principal firms concerned, Joseph Lucas and S. Smith & Sons, ended their financial years in July and are due to declare the results within a few weeks. With the £1 and 4s ordinary shares respectively quoted at 47s 6d and 15s, both are worth not much short of double the amount they stood at at the beginning of the year. The present yields of less than 3 per cent based on last year's dividends (adjusted for subsequent scrip distributions) also witness the confidence of anticipations. Both companies have increased the interim dividends on account of the latest year, S. Smith with a warning that this did not necessarily imply any change in the total. Other points common to the position of the two shares concerned include a wide margin between the rate of recent earnings and of the dividend distributions, also exception-

The Week's Price Changes

Company or Board	Nom. Value	Middle price 25th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	96	+⅛	3	3	3 2 6	97	88⅞
Brit. Elec. 1974/77	100	95		3	3	3 3 2	96⅛	87⅛
Brit. Elec. 1976/79	100	100½	+⅛	3½	3½	3 9 8	101⅛	93⅜
Brit. Elec. 1974/79	100	110	+1	4½	4½	3 17 3	111½	103⅜
Overseas Electric Supply								
Calcutta Elec.	£1	23/-xd	+1/3	6†	6†	5 4 4*	24/6	18/7
East African Power	£1	22/-	+6d	7	7	6 7 3	23/4	19/6
Nigerian Elec.	£1	24/-		10	10	8 6 8	25/-	23/6
Palestine Elec. "A"	£1	21/-		Nil	Nil	—	21/-	16/-
Perak Hydro-Elec.	£1	17/6xd		6	10	11 8 6	20/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	13/6		25	12½†	4 12 7	13/9	8/1
Aerialite	1/-	14/6	+3d	88⅓	88⅓	6 1 9	14/6	10/9
Allen, W. H.	£1	77/-		15	20	5 4 0	77/-	50/-
Aron Elec. Ord.	£1	55/-		20	15	5 9 1	55/-	43/-
Assoc. Elec. Ord.	£1	61/3	+3/9	20	11¼*	3 13 6	61/6	41/6
Automatic Tel. & El.	£1	72/-		15	15	—	73/-	57/3
Babcock & Wilcox	£1	73/9xd	+3/-	18	12*	3 4 10	73/9	47/3
Baldwin, H J.	2/-	5/-		20	20	8 0 0	5/6	3/9
Bakelite	10/-	28/9	+1/3	12½	12½	4 7 0	28/9	23/6
British Aluminium	£1	39/3	+1/-	12	10	5 2 0	40/-	33/9
B.I. Callender's	£1	52/-	+1/6	10	10	3 17 0	52/-	37/9
B.I. Callender's 6% Pref. ...	£1	26/-		6	6	4 12 4	26/6	24/3
British Thermostat	5/-	25/9		35	27½*	—	26/3	12/-
British Vac. Cleaner	5/-	13/-		25	25	9 12 4	14/6	11/6
Brook Motors	10/-	45/6		20	20*	—	45/6	29/3
Brush Ord.	5/-	8/-	+6d	4	6	3 15 0	8/3	3/6
Bulgin, A. F.	1/-	3/9	+3d	30	30	8 0 0	3/9	3/2
Burco	5/-	19/3		35	35	4 11 0*	19/3	12/1
Chloride El. Storage	£1	67/3	+1/6	20	12½*	3 14 3	68/-	46/6
Clarke Chapman	£1	65/-		17½	20	—	73/-	47/6
Cole, E. K.	5/-	19/-xc		25	27½	—	38/9	22/6
Cossor, A. C.	5/-	9/9	+6d	10	10	5 2 6	11/-	7/-
Crabtree	10/-	30/6	+3/6	17½	17½	6 11 3	30/6	23/9
Crompton Parkinson Ord. ...	5/-	20/-	+1/-	11½	20	5 0 0	20/-	14/-
De La Rue	5/-	17/9		Nil	20	5 12 9	21/-	12/3
Decca	4/-	49/6	+1/6	150	35*	—	49/6	32/-
Desoutter	5/-	23/9		18	20	4 4 3	23/9	16/1
Dewhurst	2/-	7/-		19	19	5 8 6	6/6	5/1
Dictograph Tel	2/-	7/-		20	20*	5 14 0	8/-	5/2
Dubilier Condenser	1/-	4/1½	+1½d	25	25	—	5,3	3/3
E.M.I.	10/-	19/6		12	8	4 2 0	23/-	11/3
Electrical Components	5/-	16/3		20	20	6 3 0	16/3	10/9
Elec. Construction	£1	66/3		15	15	4 11 0	66/6	53/-
Enfield Cable Ord.	£1	22/-		5	Nil	Nil	25/9	16/6
English Electric	£1	57/6	+1/9	15	10*	3 9 7	59/-	38/-
English Electric 3½% Pref. ...	£1	16/9		3½	3½	4 9 7	16/9	15/3
Ericsson Tel.	5/-	33/-	−9d	22†	25†	1 17 6†	33/9	22/9
Ever Ready	5/-	26/-	+1/6	35	40	—	26/3	17/9
Falk Stadelmann	£1	41/-	+6d	15	15	7 6 3	41/-	36/6
G.E.C Ord.	£1	60/-	+5/-	11½	12½	4 3 4	60/-	37/6
G.E.C. 6½% Pref.	£1	27/6		6½	6½	4 14 6	27/6	26/6
General Cables	5/-	17/3		30	30	8 14 0	17/3	16/3
Greenwood & Batley	£1	51/3		17½	17½	6 16 6	51/3	40/3
Hackbridge Cable	5/-	14/9		20	20	6 15 6	15/9	11/3
Hackbridge & Hewittic	5/-	25/-	+1/3	20	25	5 0 0	25/-	16/10
Hall Tel. Acc.	10/-	12/-		10	10	8 6 8	13/-	10/6
Heatrae	2/-	5/6		12½	12½	4 11 0	5/6	4/-
Henley's	10/-	21/6	+1/6	10½	10½	5 0 0	22/-	15/6
Holophane	5/-	17/6xd	+6d	20	25	7 2 9	17/6	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

ally heavy charges hitherto under the heading of the excess profits levy.

E.M.I. Results

A 10 per cent dividend from Electric & Musical Industries, and the extent of the profits recovery indicated in the accompanying statement, came up to expectations. The price of the 10s shares hardened by a few pence to 20s 6d. (The official quotation remained at 19s 6d.) At this time last year, the quotation fell away to 12s 6d as a result of the cut in the dividend from 12 to 8 per cent, and the report of a drop in trading profits from over £1½ million to £660,000. The half-way restoration of the dividend cut follows on this occasion the virtual doubling of the profits figure. This is still appreciably below the levels of the 1950–52 results, but it provides two-fold cover for the dividend disbursements, whereas last time reserves were drawn upon for that purpose.

...in Electrical Investments

Company or Board	Nom. Value	Middle price 25th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.						£ s d		
Hoover	5/-	47/6	+3/9	25	45	4 14 9	51/-	26/3
I.C.I.	£1	42/9	+2/-	13	15	3 10 3*	42/9	26/6
Intl Combustion	5/-	29/3		15	20	3 8 6	30/-	14/6
Johnson & Phillips	£1	48/9		15	15	6 3 0	52/6	47/6
Lancashire Dynamo	£1	56/3		12½	14	4 19 6	59/6	43/-
Laurence, Scott	5/-	24/3	+6d	15	20	4 2 6	25/-	14/-
Lister, R. A.	£1	31/-		9	12	—	33/-	22/6
London Elec. Wire	£1	53/9xd	+6d	15	10*	3 14 6	54/-	38/-
Lucas, J.	£1	47/6	+3/9	9½	10⅝	—	49/-	25/3
Marryat & Scott	2/-	8/3		22½	25	6 1 3	8/3	5/11
Mather & Platt	£1	53/-	+1/-	12½	15	—	53/-	32/
Metal Industries	£1	33/3	+1/9	12	9	5 8 3	42/3	29/6
Midland Elec. Mfg.	£1	75/-	+5/-	15	15	4 0 0	75/-	63/-
Morphy-Richards	4/-	23/-xd		40	35*	6 1 9	25/-	11/4
Murex	£1	49/-		15	15	6 2 6	57/-	49/-
Newman Ind.	2/-	2/4½		10	10	8 8 5	2/6	2/-
Oldham & Son	1/-	3/-		17½	17½	5 16 8	3/4	2/5
Parnall (Yate)	5/-	10/-	−6d	6	8	4 0 0	11/-	4/3
Parsons, C. A.	£1	55/-		12½*	7½*	2 14 6	60/-	38/1
Plessey	10/-	57/-	+4/6	25	30	—	58/9	37/10
Pye Deferred	5/-	33/6	+3/-	20	20*	2 19 9	33/6	15/7
Revo	10/-	14/-		27½	9*	6 8 6	20/3	14/-
Reyrolle	£1	90/-		12½	13⅜	3 1 0	92/6	66/-
Rheostatic	4/-	15/-		19	20	5 6 8	15/9	11/-
Richardsons Westgarth	5/-	11/9		15	15*	6 7 8	12/3	6/6
Scottish Cables	4/-	20/6		20	27½	5 7 3	21/9	12/11
Siemens Ord.	£1	36/-	+1/-	10	10	5 11 0	43/9	33/9
Smith (England), S.	4/-	15/-	+1/6	12½	15	—	15/-	7/8
Southern Areas	£1	27/6	+1/3	6	7½	5 9 0	27/6	17/6
Strand Elec.	5/-	9/3xd	+6d	17½	17½	9 9 3	9/3	8/3
Sturtevant	5/-	45/-	+6d	18·1†	18·9*†	2 2 0†	45/-	29/-
Sun. Elec.	£1	33/9		15	15	8 17 9	33/9	27/6
Switchgear & Cowans	5/-	12/-		22½	10	4 3 4	13/7	9/9
Taylor Tunnicliff	5/-	11/-		25	12½*	5 13 9	12/4	10/7
T.C.C.	10/-	37/6	+1/3	20	30*	—	37/6	21/3
T.C. & M.	£1	33/-		10	8⅓*	5 3 0	34/6	30/3
Telephone Mfg.	5/-	9/6		10	10	5 5 3	9/6	7/6
Thorn Elec.	5/-	27/6	+1/-	12½	20	3 12 9	27/6	13/3
Thornycroft	£1	48/-		15	15	6 5 0	49/-	33/4
Tube Investments	£1	76/3		15*	15	3 18 9	79/9	60/3
Vactric	5/-	18/-		Nil	10	2 15 6	18/9	7/6
Veritys	5/-	9/3		10	12½	6 15 2	9/3	5/-
Walsall Conduits	4/-	51/3		70	70	5 9 4	52/6	44/-
Ward & Goldstone	5/-	39/6		45	50	—	39/6	21/-
Watford	2/-	7/-xr		25	22½*	—	7/3	4/7
Westinghouse Brake	£1	81/3	+6/3	14	15	3 13 9	81/3	60/9
West, Allen	5/-	17/6	+9d	15	17½	5 0 0	17/6	12/7
Wolf Electric	5/-	17/-	+9d	15	17½	5 3 0	17/-	11/-
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A Ord.	100	86		—	6	6 19 6	89½	80
Ord.	100	54½		—	3	6 17 6	55½	52
Anglo-Portuguese	£1	25/3	−6d	—	8	6 6 9	25/9	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	71/3	+4/3	35	50	3 10 3	72/-	39/1
Cable & Wireless:								
Ord.	£1	43/-		8	9	4 3 9	49/6	26/2
4% Loan	100	98⅛		4	4⅛	4 1 3	98⅛	95⅛
Calcutta Trams	£1	21/6		2⅛†	6†	5 11 6†	24/6	17/1
Cape Elec. Trams	£1	15/6		5⅛	7	9 13 6	17/6	12/4
Marconi Marine	£1	35/-xd	+9d	10	10	5 14 3	35/-	27/6
Oriental Tel. Ord.	£1	98/9	+3/-	16	16	—	99/1	82/6
Telephone Props.	£1	92/6		—	—	—	92/6	74/6
Telephone Rentals	5/-	10/3		10	10	4 17 6	10/6	9/-

Crabtree Dividend

The 10s shares of Crabtree Electrical Industries have risen by 3s 6d to 30s 6d since the declaration of a final dividend making a total of 20 per cent in respect of the year to July last. This is 2½ per cent above the rate paid previously in each year since the company was made public in 1936. The increase materializes from an expansion of nearly half in the net trading profit at £94,000, of which the preference and ordinary distributions absorb £75,500 net. On the new basis the shares show a yield of a little over 6½ per cent.

Contactor Switchgear

Results now published by Contactor Switchgear, Ltd., are the first to appear since the introduction of the company's 5s shares to the London and Birmingham markets at the end of last year, when they were dealt in initially at around 12s. They were called 18s 9d after the announcement of the final dividend of 15 per cent, making a total of 22½ per cent for the year ended in July, and of the preliminary profits statement. The latter shows earnings which exceed the estimates given at the time of the marketing of the shares. The amount of the ordinary dividend, which is at the rate then forecast, comes well within the net surplus of £49,000 (after tax of £76,000). In addition it is proposed to make a scrip issue in the proportion of one new share for every three shares held. The yield on the shares works out at 6 per cent.

B.E.T. Interim

British Electric Traction 5s "A" deferred, which started this year at under 40s, were marked up further to 72s (subsequently easing to 71s 3d) on the declaration of a 7½ per cent interim dividend on account of the year ending next March. The decision was evidently interpreted as an improvement on the indications of dividend prospects already given at the time of the proposal for a scrip issue, as a result of which stockholders are to receive two new 5s "A" shares for every 5s deferred unit held. They were advised then to expect (subject to unforeseen events) a total dividend of not less than 20 per cent on the capital so increased. The present rate of dividend is equivalent to 16⅔ per cent on that basis.

REPORTS and DIVIDENDS

Jerusalem Electric & Public Service Corporation.—Shareholders of this company have received a circular from the Palestine Electric Corporation offering to take over their shares. The Jerusalem Corporation's board recommends acceptance as it considers it impossible to carry on economically as an independent concern. The offer is one 4½ per cent second preference Palestine share (of £1 sterling) for two 7 per cent Jerusalem preference shares (£1 Israeli) and three 4½ per cent second preference shares for four Jerusalem ordinary shares (£1 Israeli). The Jerusalem Electric board has agreed to sell the whole of the company's assets in Jordan to the Power Securities Corporation and it will consequently not now issue to shareholders the documents of title as proposed last April.

Strand Electric Holdings, Ltd.—The consolidated profit for 1953–54 rose by £31 per cent to £55,815 and the net profit after taxation by 14 per cent to £23,972. From this, plus £8,330 brought forward, £8,000 is put to general reserve and £2,132 to amortization of loan reserve; the hire stock reserve is reduced by £1,256 and £3,500 is written off the purchase price of a new subsidiary. A dividend of 17½ per cent (same) is proposed, leaving £8,857 to be carried forward. Meeting: 8th November.

Crabtree Electrical Industries, Ltd.—From a group profit of £93,879, after meeting all charges including taxation (against £65,601), the directors recommend a final dividend of 12½ per cent, bringing the total for 1953–54 to 20 per cent (against 17½ per cent). The consolidated trading profit and other receipts rose from £247,519 to £294,454. Meeting: 17th December.

Contactor Switchgear, Ltd.—The trading profit for 1953–54 rose from £111,189 to £124,889 and the net profit, after taxation, from £35,864 to £48,942. Of this £30,000 (against £20,000) is placed to general reserve; last year £10,000 was put to capital reserve. A final dividend of 15 per cent is recommended, making 22½ per cent for the year (against 15 per cent). It is also proposed to make a one-for-three scrip issue by capitalizing £50,000 from reserves. Meeting: 15th December.

Electric & Musical Industries, Ltd.—The profit and loss account for 1953–54 of the parent company and subsidiaries in England, British overseas territories and the United States shows a trading profit of £1,387,682 (against £660,039). After meeting charges the amount retained by the subsidiaries is £208,210 (against £37,185) and the balance profit of the parent company is £248,960 (£242,798). A dividend of 10 per cent is recommended on the ordinary stock (against 8 per cent.)

George Cohen, Sons & Co., Ltd., announce that in connection with the offer to ordinary and preference stockholders of the company of £1 million 4¼ per cent unsecured loan stock 1965/70 at £97 per cent, applications have been received for approximately £33 million of stock.

Anglo-American Vulcanized Fibre Co., Ltd.—The net profit for 1953–54 was £93,907 (against £81,885) and the final dividend is 12½ per cent, making 22½ per cent for the year. The directors propose to capitalize £50,000 of the amount standing to the credit of the profit and loss account and issue it to shareholders in the form of 2s shares on a one-to-three basis.

Holophane, Ltd., as already announced, reports a profit for 1953–54, after taxation, of £48,333. A pensions scheme has been established for certain employees and it is considered desirable that the directors shall participate. A special resolution for this is to be submitted at an extraordinary meeting. A recent judgment of the American courts ruled that the agreements between the American company, Holophane, Inc., and the British and French companies were contrary to American law. A motion for a new trial and amendment of the judgment has been heard but the decision has not yet been received. Meeting: 12th November.

The British Electric Traction Co., Ltd., has declared an interim dividend of 7½ per cent on the deferred ordinary and "A" deferred ordinary capital as increased to £7,470,768 by the exercise of options during the year and the two-for-one scrip issue (£4,980,512) just approved. Last year 15 per cent was paid on £2,372,256 capital.

Venner, Ltd., are placing privately £200,000 of 5¼ per cent unsecured loan stock (1963–67) to fund the temporary borrowings which have been made for the expansion of the business.

Ever Ready (Gt. Britain), Ltd., has declared an interim dividend of 10 per cent on the ordinary capital as increased by a 50 per cent scrip issue since last year's interim payment of 15 per cent.

E. K. Cole, Ltd.—At an extraordinary general meeting on 19th October the issue of 1,676,300 ordinary shares credited as fully paid up by way of capitalization of reserves was duly approved.

Bakelite, Ltd., is to pay an interim dividend of 5 per cent (against 3 per cent). The object is to even out the distribution for the year and does not indicate a higher total.

Hopkinsons, Ltd., have declared an interim dividend of 10 per cent, against 7½ per cent last year.

The Ever Ready Trust Co., Ltd., is maintaining its interim dividend at 6 per cent.

The Anglo-American Telegraph Co., Ltd., is maintaining its interim ordinary dividend at 1⅝ per cent.

The East African Power & Lighting Co., Ltd., has declared an interim dividend of 3 per cent (same).

New Companies

Plessey Sales, Ltd.—Registered in Dublin 22nd July. Capital £10,000. Selling agents for products of electricians, electrical engineers and manufacturers of all kinds of electrical machinery, etc. Subscribers: T. P. Hogan and D. Greene. The first directors are not named.

John Phillip & Son, Ltd.—Registered 11th October. Capital £3,000. Electrical engineers and general electrical installation contractors, lighting specialists and contractors, radio and television engineers, etc. Directors: J. Phillip, sen., and J. Phillip, jun. Regd. office: 38, Otley Street, Skipton, Yorks.

Essex Electrical Service (Alresford), Ltd.—Registered 1st October. Capital £4,000. Auto-electrical engineers and contractors, manufacturers of and dealers in radio apparatus, etc. Directors: E. F. A. Watts, and F. J. A. Watts. Regd. office: Colchester Road, Alresford, Essex.

English Telephone Co., Ltd.—Registered in Belfast 15th September. Capital £10,000. Manufacturers and exporters of telephone apparatus and equipment of all kinds, etc. Regd. office: 27, Shipquay Street, Londonderry.

F. & R. Rentals, Ltd.—Registered 8th October. Capital £2,000. Electrical, radio and television engineers and dealers, etc. Directors: J. W. Forth, Mrs. Nellie Forth, J. Baron and Mrs. Gladys Baron. Regd. office: 831, Manchester Road, Castleton, Rochdale.

Walter D. Allan, Ltd.—Registered in Edinburgh 8th October. Capital £10,000. Electrical, radio, mechanical and civil engineers, etc. Directors: W. D. Allan and Mrs. Janet C. Allan. Regd. office: 15, Marischal Street, Peterhead.

Increases of Capital

Standard Telephones & Cables, Ltd.—Increased by £1,500,000, in £1 ordinary shares, beyond the registered capital of £5,500,000.

Phœnix Electrical Co. (London), Ltd.—Increased by £20,000, in £1 "B" ordinary shares, beyond the registered capital of £1,500.

Treforest Electrical Services, Ltd.—Increased by £24,000, in £1 ordinary shares, beyond the registered capital of £1,000. At 13th August, 1954, South Wales Switchgear, Ltd., held a large block of shares.

J. F. Crosfield, Ltd.—Increased by £9,000, in 5,000 6 per cent cumulative preference shares of £1 and 40,000 ordinary shares of 2s each, beyond the registered capital of £1,000.

Muirhead & Co., Ltd.—Increased by £200,000, in £1 ordinary shares, beyond the registered capital of £200,000.

Kenwood Manufacturing Co., Ltd.—Increased by £36,000, in £1 ordinary shares, beyond the registered capital of £15,500.

Kenwood Electrics, Ltd.—Increased by £7,500, in £1 shares, beyond the registered capital of £1,000.

Bankruptcies

L. W. Aldis, Greengates, Top Street, Rattlesden, Suffolk, electrical engineering contractor.—Application for discharge to be heard on 9th November at the Shire Hall, Bury St. Edmunds.

J. L. R. Mack, 5, Priory Road, Tonbridge, Kent, radio and television engineer.—Last day for receiving proofs for dividend 2nd November. Trustee, Mr. J. S. Bradley-Hole, 7, Old Steine, Brighton, 1.

Liquidation

A. W. Lines, Ltd., Sunshines, Hornchurch, Essex, electrical dealers.—Last day for receiving proofs for dividend 4th November. Liquidator, Mr. A. W. Hunter, Walter House, 418–422, Strand, London, W.C.2.

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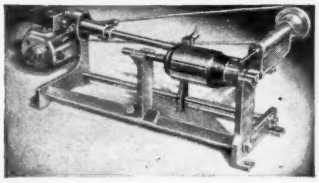

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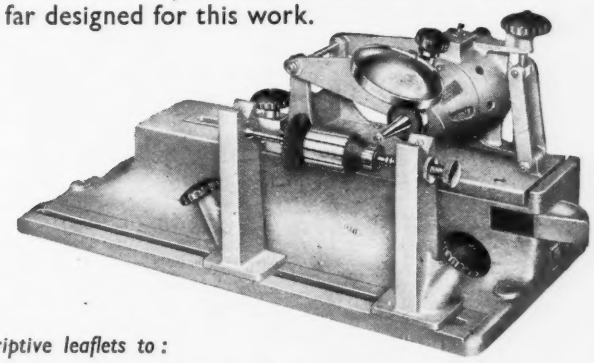

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NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 231, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 1st November

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "The Possibilities of a Cross-Channel Power Link between the British and French Supply Systems," by D. P. Sayers, M. E. Laborde and F. J. Lane.

BOLTON.—Balmoral Hotel, Bradshawgate, 7.30 p.m. A.S.E.E. Bolton Branch. "Elements of Television," by Mr. Hollingworth.

CARDIFF.—South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. "The Manchester–Kirk o'Shotts Television Radio-Relay Systems," by G. Dawson, L. L. Hall, K. G. Hodgson, R. A. Meers, and J. H. H. Merriman.

ILFORD.—Angel Hotel, 8 p.m. A.S.E.E. North-East London Branch. "Modern Lighting Technique," by Raymond Pye.

IPSWICH.—Crown and Anchor Hotel, 6.30 p.m. I.E.E. district meeting. "Fluorescent Discharge-Tube Circuits and Operating Problems," by J. Cates.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. Demonstration of stage lighting effects, by E. E. Farraday.

LIVERPOOL.—Liverpool Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Aluminium-sheathed Cables," by P. M. Hollingsworth and P. A. Raine.

LONDON.—Savoy Place, 6.30 p.m. I.E.E. London Students' Section. "Pumped Storage for Peak Load Power Supplies," by C. D. Gardiner.

MAIDSTONE.—Wig and Gown Hotel, 7.30 p.m. I.E.E. district meeting. "Local Engineering," by Alderman B. J. Watson, followed by a film.

NEWCASTLE-UPON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Centre Radio and Measurements Group. "Submerged Telephone Repeaters for Shallow Water," by R. J. Halsey and F. C. Wright, and "British Post Office Standard Submerged-Repeater System for Shallow-Water Cables, with special mention of the England–Netherlands System," by D. C. Walker and J. F. P. Thomas.

King's College, 6 p.m. N. E. Branch, Institution of Mechanical Engineers. Parsons Memorial Lecture: "Factors Influencing the Continuing Development of the Steam Turbine," by Frank Dollin.

Liberal Club, 98, Pilgrim Street, 6.30 p.m. North East Electrical Club. "Electricity in Mines," by C. A. Ritchie.

Tuesday, 2nd November

BRISTOL.—Grand Hotel, 7.30 p.m. Institute of Industrial Supervisors, Bristol Section. "Electronics in Industry," by E. I. Lowe.

CARDIFF.—Angel Hotel. A.S.E.E. South Wales Branch. Open meeting. "The Design of Electrical Installations in Public Buildings — with particular reference to Schools," by R. C. Woodward.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "The Possibilities of a Cross-Channel Power Link between the British and French Supply Systems," by D. P. Sayers, M. E. Laborde and F. J. Lane.

ELTHAM.—Congregational Church Hall, Court Road, 8 p.m. A.S.E.E. South-East London Branch. "Modern Magnets."

HAMMERSMITH.—Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. "The Push Button and Loudspeaker Intercommunication Telephone," by D. H. Weston.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. "Technical Arrangements for the Sound and Television Broadcasts of the Coronation Ceremonies on 2nd June, 1953," by W. S. Proctor, M. J. L. Pulling and F. Williams.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. Discussion on "Boreholes—Instrumentation for Measurements at Depth," opened by P. Threadgold.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "Aluminium-sheathed Cables," by P. M. Hollingsworth and P. A. Raine.

Wednesday, 3rd November

BIRMINGHAM.—James Watt Institute, Great Charles Street, 7 p.m. Junior Institution of Engineers, Midland Section. "The Modern Tendency of Railway Signalling Practice," by W. J. Sadler.

DAGENHAM.—I.E.E. London Students' Section. Visit to Ford Motor Co., Ltd., at 2 p.m.

EDINBURGH.—12, Rothesay Place, 7 p.m. I.E.S. Edinburgh Centre. "The Design and Application of Flameproof Lighting Equipment," by D. A. Strachan.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "The Possibilities of a Cross-Channel Power Link between the British and French Supply Systems," by D. P. Sayers, M. E. Laborde and F. J. Lane.

HARRINGAY.—"Queen's Head," 677, Green Lanes, N.4, 7.45 p.m. A.S.E.E. North London Branch. "Cored Solders," by H. L. Schuster, preceded by film, "The Vital Link."

HOVE.—Southern Electricity Board, 6.30 p.m. I.E.E. Southern Centre. "An Assessment of the Impregnated Pressure Cable," by Dr. L. G. Brazier, D. T. Hollingsworth and Dr. A. L. Williams.

LEICESTER.—College of Art & Technology, The Newarkes, 6.30 p.m. Incorporated Plant Engineers, Leicester Branch. "Process and Industrial Heating," by J. C. Edwards.

Bell Hotel, 6.30 p.m. Institution of Heating and Ventilating Engineers, East Midlands Branch. "Getting the most out of your Steam," by B. Pheasant.

LONDON.—At the Institution of Mechanical Engineers, Birdcage Walk, 6 p.m. Institution of Heating and Ventilating Engineers. "Meteorological Data and Design Temperatures," by H. C. Jamieson.

MANCHESTER.—Café Royal, 7 p.m. I.E.S. Manchester Centre. Annual dinner and presidential address by E. C. Lennox.

MIDDLESBROUGH.—Cleveland Scientific & Technical Institution, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "An Assessment of the Impregnated Pressure Cable," by Dr. L. G. Brazier, D. T. Hollingsworth and Dr. A. L. Williams.

NEWCASTLE-UPON-TYNE.—Roadway House, 8, Oxford Street, 6.15 p.m. I.E.S. Newcastle Centre. Sports lighting symposium. Chairman, W. Robinson.

PRESTON. — 49a, Fishergate, 7.30 p.m. A.S.E.E. Preston Branch. "Rotary Switches," by G. R. Cowan.

STAFFORD.—English Electric Co.'s Lecture Room, Salt Avenue/Sabine Street, 7.15 p.m. I.E.E. North Staffs Sub-Centre Students' Section. "Vacuum Techniques with particular reference to Steel Tank Rectifiers," by N. L. Potter.

WEST BROMWICH.—Lewisham Hotel, 7.30 p.m. Institute of Industrial Supervisors, West Bromwich Section. "The Transmitting Side of Television," by R. C. Harman.

Thursday, 4th November

BANBURY.—I.E.E. Rugby Sub-Centre district meeting. Chairman's address by D. Edmundson.

CHELMSFORD.—Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "The Owen Falls, Uganda, Hydro-Electric Development," by Sir Charles Westlake.

CROYDON.—Café Royal, North End, 8 p.m. A.S.E.E. South London Branch. Lecturettes.

DARLASTON.—Rubery Owen & Co., 7.30 p.m. Institute of Industrial Supervisors, Wednesbury & Darlaston Section. "Atomic Energy in Industry," by J. H. Fremlin.

GLASGOW.—39, Elmbank Crescent, 7 p.m. British Institution of Radio Engineers, Scottish Section. "The Latest Developments in T.V. Cameras," by H. McGhee.

39, Elmbank Crescent, 7.30 p.m. I.E.S. Glasgow Centre. "The Design and Application of Flameproof Lighting Equipment," by D. A. Strachan.

LIVERPOOL.—College of Technology, Byron Street, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "Radio Receiving Valve Manufacture," by G. P. Thwaites.

LONDON.—May Fair Hotel, W.1, 12.45 for 1 p.m. Federation of Associations of Specialists and Sub-Contractors. Annual luncheon.

Savoy Place, 5.30 p.m. I.E.E. ordinary meeting. "A Transatlantic Telephone Cable," by Dr. M. J. Kelly, Sir Gordon Radley, G. W. Gilman and R. J. Halsey.

MANCHESTER.—College of Technology, Sackville Street, 7 p.m. British Institution of Radio Engineers, North-Western Section. "Electronic Servo Mechanisms," by J. L. Russell.

NOTTINGHAM.—The University, 7 p.m. I.E.E. East Midland Centre Students' Section. "Construction of 132 kV Lines," by H. G. New.

E.M.E.B., Smithy Row, 6 p.m. I.E.S. Nottingham Centre. "Lighting of Shipyards," by J. S. McCulloch.

YORK.—Technical College, 159, Tadcaster Road, 7.15 p.m. Ministry of Works. "Small Heating and Ventilating Installations," by A. M. Palmer.

Friday, 5th November

BIRMINGHAM.—Grand Hotel, Colmore Row, 6.30 for 7 p.m. Birmingham Electric Club, Golden jubilee banquet.

LIVERPOOL.—9, The Temple, 24, Dale Street, 7.30 p.m. A.S.E.E. Liverpool Branch. "Modern Lighting Technique," by Raymond Pye.

LONDON. — Victoria Halls, Bloomsbury Square, 7.30 p.m. I.E.E. London Students' Section (jointly with the Graduates' and Students' Sections of the Institutions of Civil and Mechanical Engineers). Dance.

WEMBLEY PARK.—The Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North-West London Branch. "Control of Industrial Refrigerating Plant," by F. J. Hagger.

WORKINGTON.—Cumberland Technical College, 7 p.m. I.E.E. North Eastern Centre district meeting. "Safety in the Use of Portable and Transportable Electrical Equipment in Industry," by J. W. Bunting.

Saturday, 6th November

DONCASTER.—I.E.E. North Midland Students' Section. Visit to British Railways Workshops, at 3 p.m.

Sunday, 7th November

CHISLET.—I.E.E. London Students' Section. Visit to Chislet Colliery at 10 a.m.

B.B.C. Handbook, 1955

A full account of the broadcasting services and the programme departments is given in a new British Broadcasting Corporation publication, "The B.B.C. Handbook, 1955" (224 pp., 5s). The constitution and Charter obligations of the B.B.C. are explained and there is a long review of broadcasting in 1953–4, supplemented by lists of representative programmes and the accounts for the year.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 1st December from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1950

12457. Selectra, Ltd. — Synchronous dynamo electric machines. 30th March, 1951. (719212.)

14183. Simplex Electric Co., Ltd.—Electrically heated smoothing irons. 4th June, 1951. (719373.)

16118. Oostwoud, J.—Open arc lamps and electrodes therefor. 28th January, 1950. (719213.)

22960. Adamson, R. A.—Electric soldering irons. 19th September, 1951. (719533.)

1951

7072. Oak Mfg. Co.—Electromagnetic interrupters. 27th March, 1951. (719540.)

8742. Anderson, Boyes & Co., Ltd.—Polyphase current transformers for use in earth leakage protective systems. 14th July, 1952. (719219.)

9876. Atkins, B. R., Lanham, M. J., and Maer, P. S.—Brushes for dynamo electric machines. 28th April, 1952. (719542.)

13844. Howard, G. J. E.—Eddy current coupling. 2nd July, 1952. (719303.)

13890. Aluminum Co. of America.—Making of mechanical joints between electrical conductors. 12th June, 1951. Addition to 632487. (719304.) 13891. Electrical joint compounds. 12th June, 1951. (719305.)

17926. Simplex Electric Co., Ltd.—Mechanical interlocks between electrical switchgear and the casing of electrical equipment controlled thereby. 25th July, 1952. (719385.)

19800. Metropolitan-Vickers Electrical Co., Ltd.—Ultrasonic soldering irons suitable for use in tinning aluminium and its alloys. 21st August, 1952. (719386.)

19900. Clang, Ltd., Austen, H. E., and Harwood, C. D.—Electrical plug and socket couplings. 20th August, 1952. (719387.)

24657. National Research Development Corporation.—Apparatus for recording a series of electrical signals. 14th October, 1952. (719555.)

24833. English Electric Co., Ltd.—Cases for electrical equipment. 24th October, 1952. (719556.)

25965. Holophane, Ltd., and English, S.—Pendant lighting fittings. 6th November, 1952. (719394.)

28314. National Research Development Corporation.—Electronic apparatus for the storage of digital information. 3rd March, 1953. (719397.)

29506 & 29626. General Electric Co., Ltd., Bowtell, J. N., and McKeag, A. H.—Measuring or indicating instruments. 17th December, 1952. (719398/9.)

29856. Ruston & Hornsby, Ltd., and Fielden, G. B. R.—Gas turbo-generator installations. 2nd March, 1953. (719316.)

1952

2044. Dunlop Rubber Co., Ltd.—Electric resistance heaters. 16th December, 1952. (719318.)

2580. Electric & Musical Industries, Ltd.—Thermionic valve amplifiers. 2nd February, 1953. Addition to 630132. (719476.)

3183. English Electric Co., Ltd.—Multi-stage axial flow compressors. 6th February, 1953. (719236.)

6201. Allard, G. E.—Automatic electrical circuit breakers. 10th March, 1952. (719409.)

6968. British Thomson-Houston Co., Ltd.—Radiation measuring devices. 24th February, 1953. (719485.)

7814. Oldham & Son, Ltd., and Prout, L. R.—Electric batteries. 3rd February, 1953. (719335.)

9580. Marconi's Wireless Telegraph Co., Ltd.—Synchronizing arrangements for use in television systems. 23rd January, 1953. (719338.)

9822. Metropolitan-Vickers Electrical Co., Ltd., and Jensen & Co., Ltd., G. K.—Control systems for electric lifts and the like. 25th March, 1953. (719250.)

14313. Standard Telephones & Cables, Ltd.—Circuit arrangement for receiving telegraph signals by employing, in particular, the twinplex method. 6th June, 1952. (719262.)

14836. Ward, A. B.—Electrical connector fitments. 11th June, 1953. (719500.)

16209. Compagnie Electro-Mecanique.—Permanent automatic balancing device. 27th June, 1952. (719422.)

16292. Selectra, Ltd. — Synchronous dynamo electric machines. 27th June, 1952. Divided out of and addition to 719212. (719267.)

16677. Astral Switchgear, Ltd., formerly Astral Engineering Co., Ltd.—Electrical connectors. 18th May, 1953. (719583.)

17555. British Thomson-Houston Co., Ltd.—Manufacture of electric discharge lamps. 16th July, 1953. (719269.)

17568. Standard Telephones & Cables, Ltd.—Amplifier circuit for high frequency transmission, comprising a carrier stage and an additional stage. 11th July, 1952. (719502.)

18178. Westinghouse Electric International Co.—Liquid break electric circuit interrupters. 18th July, 1952. (719425.)

20575. Siemens & Halske Akt.-Ges.—Circuit arrangements for telecommunication, and particularly telephone, installations having relay selectors. 15th August, 1952. (719506.)

22081. Daimler-Benz Akt.-Ges.—Electrically operated control means for change-speed gears. 2nd September, 1952. (719277.)

22871. British Broadcasting Corporation.—Magnetic recording and reproducing apparatus. 31st July, 1953. (719281.)

23171. Accumulatoren-Fabrik Akt.-Ges.—Electric accumulators. 15th September, 1952. (719595.)

23321. Philips Electrical Industries, Ltd.—Method of producing finely divided magnetic iron oxide. 17th September, 1952. (719283.)

23996. Siemens-Reiniger-Werke Akt.-Ges.—High tension units for X-ray apparatus. 24th September, 1952. (719512.)

24345. General Electric Co.—Clothes dryers. 29th September, 1952. (719431.)

24388. Minister of Supply.—Electrical delay circuits. 28th September, 1953. (719354.)

24840. British Thomson-Houston Co., Ltd.—Rotary liquid pumps. 3rd October, 1952. (719285.)

25198. D.P. Battery Co., Ltd.—Electric storage battery plates. 29th September, 1953. (719598.)

25465. Bangert, H.—Device for heating liquids electrically. 10th October, 1952. (719433.)

25557. Murray, C. T.—Electric junction boxes. 5th October, 1953. (719599.)

25603 & 26024. Du Pont de Nemours & Co., E. I.—Fluorescent screens. 13th and 16th October, 1952. (719600 and 719603.)

25909. Dussek Bros. & Co., Ltd., Thompson, A. W., and Freeborn, A. S.—Impregnating compositions for use in the manufacture of electric cables and condensers. 23rd March, 1953. (719602.)

25988. Philips Electrical Industries, Ltd.—Electromagnetic devices for modulating the amplitude of high frequency waves. 16th October, 1952. (719517.) 27982. Circuits for generating, amplifying or modulating millimetre waves. 6th November, 1952. (719435.)

29783. Western Electric Co., Inc.—Ferro-electric memory elements and circuits therefor. 25th November, 1952. Addition to 717104. (719288.)

31509. Forges et Ateliers de Constructions Electriques de Jeumont.—Electric lamp signalling systems. 12th December, 1952. (719609.)

32328. Naamlooze Vennootschap Industriele Onderneming W. H. Braskamp.—Rotary electric switches. 19th December, 1952. (719444.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

6th November

SPIROD. No. 731,017, Class 7. Electrically heated extruder cylinders, being parts of extruding machines.—John Royle & Sons, Paterson, N.J., U.S.A. Address for service, c/o, Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

NORA. No. 717,038, Class 9. Television apparatus.—Heliowatt Werke Elektrizitats-Akt.-Ges., Berlin-Charlottenburg, Germany. Address for service, c/o G. F. Redfern & Co., Redfern House, Dominion Street, E.C.2.

INTERVISION. No. B723,679, Class 9. Apparatus and parts for use in transmitting and receiving broadcast televised images.—Pye, Ltd., St. Andrews Road, Cambridge.

SIPO. No. 730,490, Class 9. Electric accumulators, cells and parts.—Allen Levin, Ltd., 4, Drapers Gardens, Throgmorton Avenue, London, E.C.2.

CRONAPRES. No. 731,944, Class 9. Electric bell systems, bell transformers, push buttons, buzzers, etc., and switches and covered electric wire.—S. G. McCrone, trading as the Cronapress Co., 19, Goodshaw Avenue, Crawshawbooth, Rossendale, Lancs.

13th November

INVINCIBLE. No. 730,292, Class 9. Scientific, electrical, radio, etc., apparatus and instruments, but not including insulated wire.—Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester.

NYLEX. No. 730,330, Class 9. Scientific and electrical apparatus and instruments, etc.—Thurger Bolle (Successors), Ltd., Orient House, Church Way, Wellingborough.

SOLDRON. No. B730,449, Class 9. Electrically heated soldering instruments.—K.W.L. Kemp, 14, Leamington Close, Sundridge Park, Bromley, Kent.

SAXOTHENE. No. 731,130, Class 9. Insulated electric cable and wire.—Saxonia Electrical Wire Co., Ltd., Roan Works, Roan Street, Greenwich, S.E.10.

PLASTAB. No. 731,407, Class 9. Electronically controlled measuring, weighing and recording apparatus.—British Tabulating Machine Co., Ltd., 17, Park Lane, W.1.

"SEMCA" and design. Nos. 730,001 and 730,190, Class 11. Carbons for electric arc lamps.—Eletrocarbonium Societa per Azioni, Milan. Address for service, c/o G. F. Redfern & Co., Redfern House, Dominion Street, London, E.C.2.

HERCULES. No. 730,682, Class 11. Electric immersion heaters.—Range Boilers, Ltd., Bridge Street, Stalybridge, Ches.

PELEFILM. No. 732,062, Class 17. Insulating materials in the form of films.—Metropolitan-Vickers Electrical Co., Ltd., 1–3, St. Paul's Churchyard, London, E.C.4.

GENERATION AND DEVELOPMENT

Electricity Sales in September

In September 5,508 million kWh was generated by the British Electricity Authority (see *Electrical Review*, 22nd October, page 660). The accompanying table analyses the Electricity Boards' sales. The national figures show an increase over September, 1953, of 12 per cent, but when corrected for weather conditions which were colder than a year earlier, the increase is 9·8 per cent. The number of effective working days was the same as in September last year, i.e., 27·66.

Leakage Trips for Houses

Slight shocks were said to have been received by tenants of ten council houses at Kidderminster. The surveyor told the Rural District Council that these arose from the unsatisfactory earthing arrangements. Upon his recommendation the Council accepted a tender by the Midlands Electricity Board for fitting 30 A d.p. earth leakage circuit breakers in the houses for £30.

Fluorescent Lighting at Luton

Luton Highways and Planning Committee proposes to install fluorescent lighting along a section of trunk road A.6 at an estimated cost of £9,885. Preliminary approval has been received from the Ministry of Transport and Civil Aviation. Proposals for sodium lighting at a cost of £8,401 have been submitted to the Ministry and other schemes are now to be sent for approval.

Rewiring Pre-War Houses

The borough engineer of Ilford has reported that the wiring in a number of pre-war houses inspected has reached the end of its useful life and needs renewing. It is proposed to carry out the work of rewiring 760 houses by instalments, the total cost being estimated to exceed £30,000.

Supplies to Smallholdings

The North Riding County Council has approved proposals by the North Eastern Electricity Board for the supply of electricity to smallholdings at Catterick, Bromakin Grange and Firby. The Council will contribute £1,395 towards the initial cost.

Outdoor Plant for St. Lawrence

The huge power-house which will form the keystone of the St. Lawrence River power project will be of a modified outdoor type, it is learned. According to officials of the Ontario Hydro-Electric Power Commission, there will be no conventional building over the generators but the units themselves will be protected by removable housings. The St. Lawrence station will be the first in the Commission's system with outdoor generators. Architectural treatment of the power-house will be simple and functional. Instead of the 36 generators originally planned, the power-house will contain only 32, divided equally by the international boundary, but this will not mean a decrease in the power produced.

In addition to the three main structures —the power-house, the Long Sault dam and the Iroquois dam—channel improvements involving the excavation of about 61 million cu yd of earth and 5 million cu yd of rock will be necessary. Estimates of the area to be flooded have been increased to about 40,000 acres, half on each side of the river. About 3,000 acres in Ontario and 8,600 in New York State will require clearing work before they can be flooded.

New Power Station for Rotterdam

The first pile was driven recently for a large power station to be erected on the west side of the Rotterdam Wall Dock. This new station will eventually have a total capacity of from 500,000 to 600,000 kW, and will then be the largest in the country.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for September (million kWh)			Twelve Months Totals Ended 30th September (million kWh)		
	1953	1954	Inc. or Dec. %	1953	1954	Inc. or Dec. %
London	379·2	424·5	+11·9	5,692·1	5,949·4	+ 4·7
South Eastern	238·1	265·7	+11·6	3,323·2	3·563·1	+ 7·2
Southern	237·0	324·3	+11·0	3,993·1	4,199·3	+ 7·9
South Western	142·8	173·5	+21·5	1,974·0	2,129·0	+13·6
Eastern	397·2	445·9	+12·2	5,400·4	5,784·7	+ 7·1
East Midlands*	351·9	395·6	+12·4	4,613·6	4,916·7	+ 6·6
Midlands*	474·6	526·4	+10·9	6,101·5	6,662·0	+ 9·2
South Wales*	295·4	326·0	+10·4	3,392·1	3,929·5	+12·9
Merseyside and N. Wales* ...	274·9	310·0	+12·8	3,414·4	3,767·9	+10·4
Yorkshire*	472·5	523·7	+10·8	5,931·5	6,455·0	+ 7·9
North Eastern*	290·8	316·2	+ 8·7	3,593·0	3,836·1	+ 6·8
North Western*	525·7	574·5	+ 9·3	6,623·5	7,222·7	+ 9·0
South-East Scotland	98·1	109·3	+11·4	1,276·4	1,402·3	+ 9·9
South-West Scotland* ...	234·1	260·8	+11·4	3,089·6	3,317·5	+ 7·4
Total all Area Boards ...	4,462·3	4,976·3	+11·5	59,253·4	63,035·2	+ 8·2
Direct Supplies by Central Authority	80·2	109·9	+37·0	897·6	1,138·4	+26·8
Grand Total	4,542·5	5,086·2	+12·0	59,155·0	64,173·6	+ 8·5
Mainly Industrial Areas* ...	2,919·9	3,237·2	+10·7	36,809·2	40,007·4	+ 8·7
Mainly Non-Industrial Areas	1,542·4	1,743·1	+13·0	21,449·2	23,027·8	+ 7·4

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

CONSULTATIVE COUNCIL TOPICS

THE YORKSHIRE Electricity Consultative Council at a recent meeting held in Leeds agreed the evidence which it proposes to submit to the Herbert Committee of Inquiry. The Council also accepted a resolution from the Huddersfield District Committee that, with the problem of pollution of the atmosphere in mind, a substantial reduction in the rate of purchase tax on electric radiators and immersion heaters would be an incentive for domestic consumers to use alternative means of space and water heating. This resolution is to be sent to the Chancellor of the Exchequer.

The Council has appointed a sub-committee to review the incidence of the Board's standard domestic tariff on consumers' accounts. The sub-committee is to consider the position of cellar-heads, sculleries and kitchens as assessable under the tariff. The Board is being asked by the Council to give additional consideration to the provision of electricity to domestic premises which already have a supply of gas.

At a meeting of the LONDON Electricity Consultative Council under the chairmanship of Mr. I. J. Hayward, LL.D., J.P., a suggestion that some provision should be made for the reading of meters on Saturday mornings was referred to the Board. It was indicated that the possibility of meter readers being provided with uniforms was being considered.

The subject of apparatus and wiring maintenance schemes had again been taken up with the Board, which had also been approached in the matter by the Metropolitan Boroughs Standing Joint Committee. The Board was of the opinion that the responsibility for replacement of defective wiring should rest with the landlord or the tenant, who, if necessary, should take advantage of the financial and other facilities made available to them by statute.

The quarterly report of the NORTH EASTERN Electricity Board submitted to a meeting of the Consultative Council at Newcastle-on-Tyne stated that during June, July and August, 299 new substations had been brought into commission. The great majority of these related to electricity supplies for villages and farms, and in addition high voltage supplies were afforded to 18 industrial and commercial consumers. During the three months 283 agricultural premises were supplied and negotiations were completed for supplying a further 329. Thirteen villages were brought on supply. During the quarter the Electricity Board approved estimates amounting to £1,111,552 covering electricity supplies for 75 housing projects and 226 rural extensions.

Support for Trolley-Buses

Surbiton Borough Council has decided to support the demand of the London Passengers' Association that trolley-buses should be retained by London Transport.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Brazil.—6th December. State Electricity Commission, Port Alegre. 3,045 km. of steel cored aluminium electric cable, and 695 km. of galvanized steel electric cable. (E.S.B. 23847/54. Ten/10990.)*

Burma—9th November. Electricity Supply Board, Rangoon. Short-wave communication sets. (E.S.B. 25005/54. Ten/11175.)* 16th November. Underground cables and accessories. (E.S.B. 24986/54. Ten/11166.)* H.v. insulators. (E.S.B. 24984/54. Ten/11167.)* 18th November. Haulage way for the Baluchaung hydro-electric project. (E.S.B. 25006/54. Ten/11179.)*

Cleethorpes. — 15th November. Town Council. Electrical installations in 70 dwellings. (See this issue.)

Durham.—6th November. County Education Committee. Electrical installations in schools. (See this issue.)

Ethiopia. — 7th November. Ministry of Agriculture, Addis Ababa. Thermal power plant, 5,000 kW. (E.S.B. 24370/54. Ten/11203.)*

Formosa.—10th December. Foreign Operations Administration, Taipei. 1,200 kVA, 3,300/440/220 V transformer. switchgear, meters, etc. (E.S.B. 24652/54. Ten/11158.)*

Kuwait.—20th November. Government Department of Electricity. Electric lamps, batteries and torches. (E.S.B. 24884/54. Ten/11144.)*

Portuguese East Africa.—15th November. Ports, Railways and Transport Department, Lourenço Marques. Spare parts for electric power station. (E.S.B. 25004/54. Ten/11176.)*

South Africa.—17th November. Stores Department, South African Railways, Johannesburg. Automatic telephone exchange. (E.S.B. 24672/54. Ten/11117.)* 18th November, Train lighting batteries. (E.S.B. 24937/54. Ten/11159.)*

18th November. Union Tender and Supplies Board, Pretoria. Electrical laboratory equipment. (E.S.B. 24457/54. Ten/11103.)*

Southern Rhodesia.—11th November. Electricity Supply Commission, Salisbury. 470 miles of ·025 sq in copper or equivalent steel cored aluminium or aluminium alloy conconductor and accessories. (E.S.B. 24872/54. Ten/11137.)*

Spain.—15th November. Foreign Operations Administration, Madrid. Two 10 MVA synchronous compensators. (E.S.B. 24454/54. Ten/11157.)* 27th November. One 25 MVA synchronous compensator. (E.S.B. 24455/54. Ten/11151.)*

United States.—9th November. Bureau of Reclamation, Denver, Colorado. 230 kV control board for Watertown substation and unmounted carrier current control and auxiliary relays and accessories for Granite Falls substation. (E.S.B. 24562/54. Ten/11109.)*

23rd November. Army Corps of Engineers, Portland, Oregon. Main unit lighting substations for the Dallas Dam power house. (E.S.B. 24585/54. Ten/11153.)*

Uruguay.—30th November. Administracion General de las Usinas Electricas y los Telefonos del Estado. Telephone cables. (E.S.B. 24989/54. Ten/11172.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Barking.—Town Council. Installation of electricity at the new Town Hall (£2,682).—F. H. Wheeler.

Bexley. — Corporation. Recommended. Electrical installation work, Gravel Hill Junior Mixed and Infants' School (£1,579).—C. W. Gosling.

Clare.—R.D.C. Internal wiring in 48 houses, Wickhambrook and Stansfield (£1,224).—R. D. Watts.

Durham.—County Education Committee has accepted the following tenders for electrical installations at schools, etc.:—New Penshaw County (£1,140).—A. Higginbotham and Sons, Bradford. Blaydon West County (£2,450).—Storey and Crowe, Crawcrook, Ryton. Hartlepool Galleys Field Modern (£1,055).—Higginbotham and Sons, Bradford. Billingham North Roseberry Road County (£1,365).—Dixon Barker and Son, West Hartlepool. Easington Technical College (£10,682).—B. French, West Hartlepool. Peterlee Acre Rigg Infants' and Junior (£4,881).—Higginbotham and Sons, Bradford.

Newcastle-on-Tyne.—Regional Hospital Board. Electrical installations in new villas: St. George's Hospital, Morpeth (£2,825).—G. B. Carnegie, Newcastle. Aycliffe Hospital (£2,243).—G. Bowman, Ltd., Carlisle. St. Luke's Hospital, Middlesbrough (£3,327).—North of England Engineering and Electrical Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Burnley.—Bus garage; Ribble Motor Services, Frenchwood Avenue, Preston.

Canvey Island.—R.C. primary school; Burles & Newton, architects, 59, Exford Avenue, Westcliff-on-Sea.

Chichester.—Extensions to Garlingwell Hospital (£45,000); South West Metropolitan Regional Hospital Board, 11, Portland Place, London, W.1.

Coventry.—R.C. school at Potters Green; Hellberg & Harris, architects, Queen Victoria Road.

Darlington.—Children's home; county architect, Court Lane, Durham

Dartford.—Houses (188), Fleet estate, for Franklin & Co. (Erith), Ltd.; Prall & Prall, surveyors, 53, Spital Street.

Derby.—Technical college; Grenfell, Baines & Hargreaves, architects, 12/24, Guildhall Street, Preston.

Doncaster.—Cinema, Hallgate; Sir Robert McAlpine & Co., Ltd.

Secondary school, Intake; borough architect.

Durham.—New schools at Bowburn. Billingham, Bishop Auckland, Durham, Horden, Felling and South Stanley; county architect, Court Lane, Durham.

East Lothian.—Houses (124); county architect, County Buildings, Haddington

Easton (Norfolk).—Additions to the Norfolk School of Agriculture (£35,000): chief education officer, Stracey Road, Norwich.

Edinburgh.—Neuro-surgical block for Western General Hospital; J. Holt, architect, 8, Drumsheugh Gardens.

Edmonton.—Additional factory; Times Veneer Co., Ltd., Goodwin Road, N.9.

Glasgow.—Additional factory; R. Paterson & Sons, Ltd., Greendyke Street.

Glenrothes.—Shops and offices, New Town Centre (£55,000); P. Tinto, architect, Woodside.

Grimsby.—Swimming bath; borough architect, Council Offices.

Hatfield.—Factory (£70,000) for Die Casting Machine Tools, Ltd.; Barnes, Challen & Cross, architects, 96, Gloucester Place, London, W.1.

Hendon.—Flats (24), Great North Way; Morrison & Rose, architects, 8, Park Street, London, W.1.

Houghton-le-Spring.—Licensed premises, Barnwell estate, for Newcastle Breweries, Ltd.; J. Oswald and Sons, architects, 68, Northumberland Street, Newcastle-on-Tyne.

King's Lynn.—First stage of technical college; education architect, Stracey Road, Norwich.

Kirkby.—Roman Catholic school (£50,000); Frederick Clark & Sons, Ltd., builders, 191, Heyworth Street, Liverpool, 5.

Leicester.—Proposed Victoria Park pavilion (£40,000); city architect.

Liverpool.—Development of housing estate at Lee Park, Childwall (£100,000), city engineer, Municipal Buildings, Dale Street, 2.

Manchester.—Works extensions; Bank Bridge Rubber Co., Ltd., Bank Street, Clayton.

Showrooms and offices, 13/19, Oldham Street; C. & A. Modes, Ltd., North Row, London, W.1.

Middlesbrough.—Factory additions for Foister, Clay and Ward, Ltd.

Newcastle (Staffs).—Housing estate, Seabridge Lane area (470 houses, shops, schools, church, etc.); borough surveyor, Lancaster Buildings, High Street.

Newton Aycliffe.—Houses (370) for Aycliffe Development Corporation; G. A. Goldstraw, chief architect.

Norfolk.—Secondary modern school at Watton and primary school at Thetford; F. L. Ralphs, chief education officer, Stracey Road, Norwich.

Northampton.—Dwellings (71), including 10-storey block of 38 flats, in town centre (£133,114); borough architect.

Norwich.—Four-storey building in Coburg Street for John Mackintosh & Sons, Ltd.; Frederick Snow & Partners, Monro Building, Wellington Street, London, W.C.2.

Nuneaton.—Flats (48), Vernons Lane; borough surveyor, Council House.

Peterborough.—Enlargement of county secondary schools in Lincoln Road; architect to the Joint Education Board, Peterborough.

Rawmarsh (Yorks).—Church and hall; R. A. Bonchetti, architect, 3, Princes Square, Harrogate.

Scunthorpe.—School for educationally subnormal children in Bushfield Road (£41,546); county architect, Lincoln.

Sheffield.—Chaucer Secondary Modern School; Yorke, Rosenberg & Mardall, architects, 2, Hyde Park Place, London, W.2.

Swadlincote.—Proposed civic centre, including public buildings, bus station, etc. (about £100,000); William Blair, architect to U.D.C., 8, St. James Street, Derby.

Thirsk.—Grammar and modern school; Leathart, Son & Tingay, architects, 49, Welbeck Street, London, W.1.

Thornaby (Yorks).—Modern school; Johns and Slater, architects, 32, Foundation Street, Ipswich.

Tipton.—Factory for Conex Terna, Ltd.; W. Neenan (Contractors), Ltd., 207, Spon Lane, West Bromwich.

Warwickshire.—Secondary schools at Hartshill (£187,000), and Solihull (£135,000), as part of 1955-56 programme; county architect, Shire Hall, Warwick.

Welwyn Garden City.—Four factories for Development Corporation; M. J. Deane, Ltd., builders, 84, Woodhill, S.E.18.

Bullers CERAMICS

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High quality material and dimensional precision are attributes of Bullers die-pressed products.
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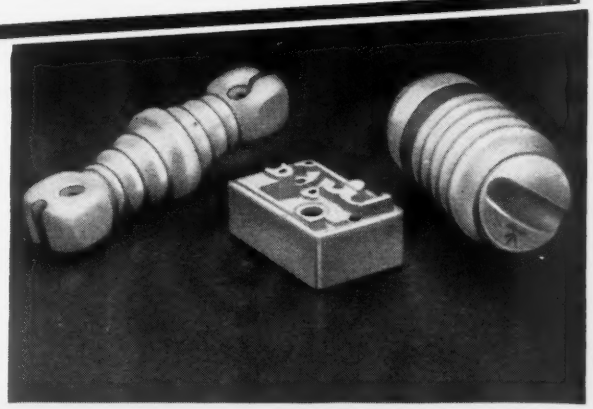

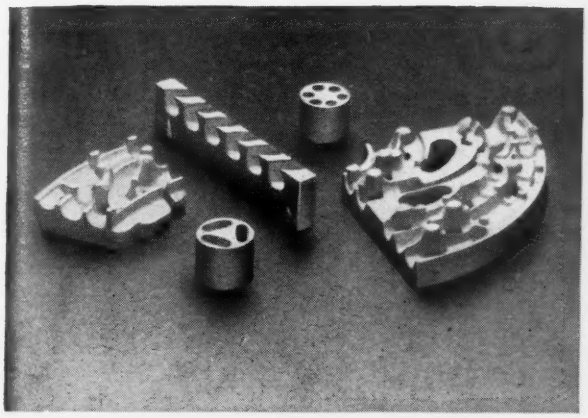

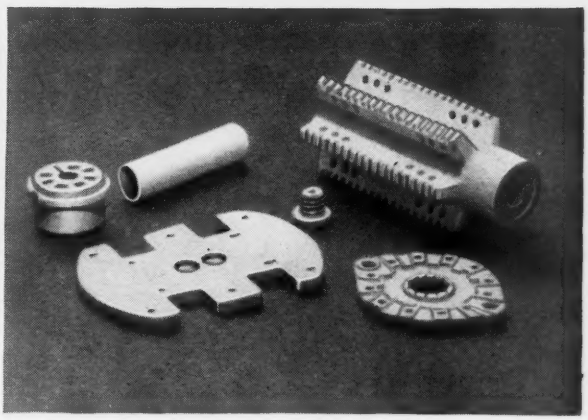

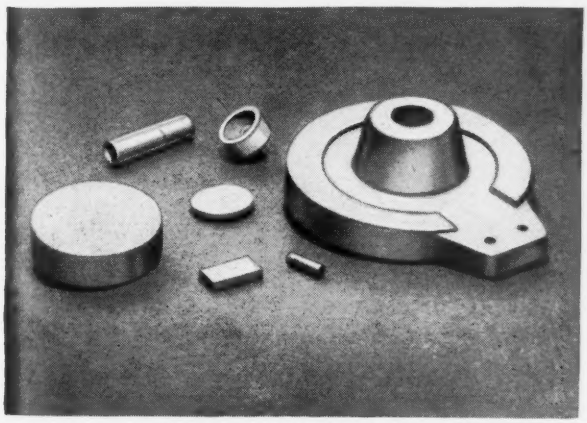

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TRADE MARK TRADE MARK

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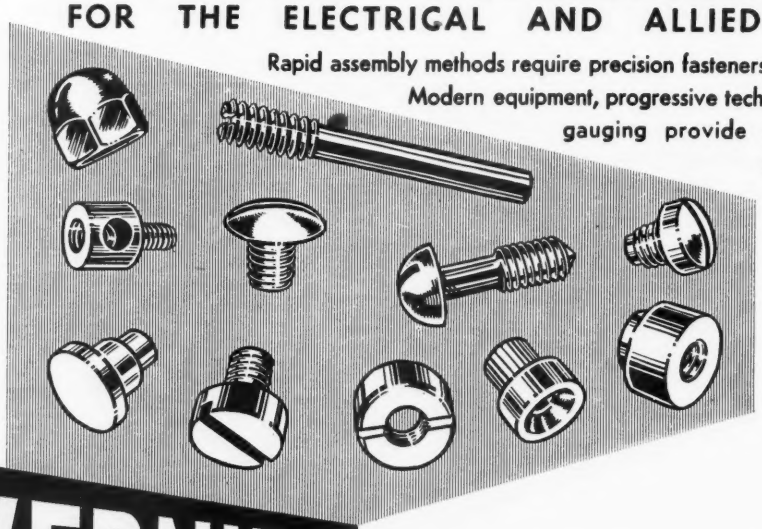

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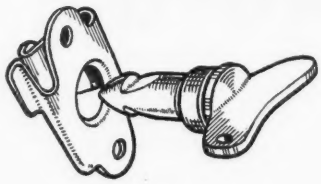

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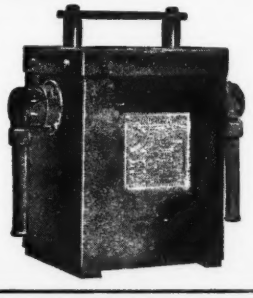

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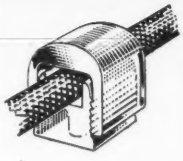

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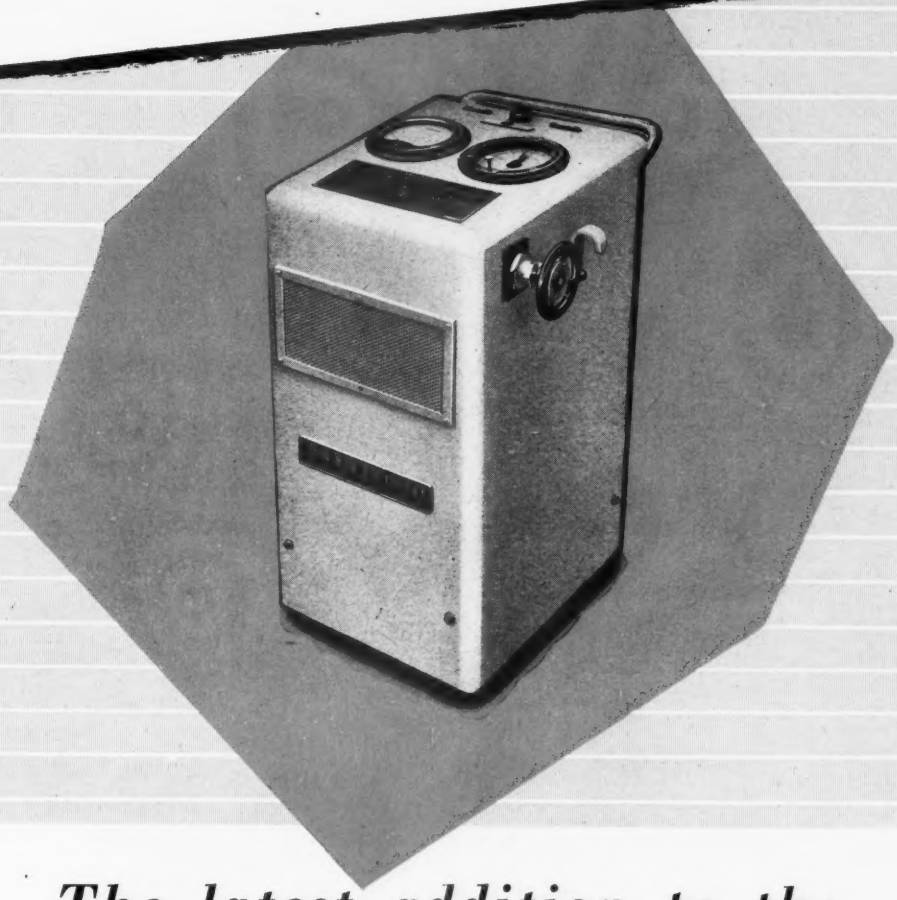

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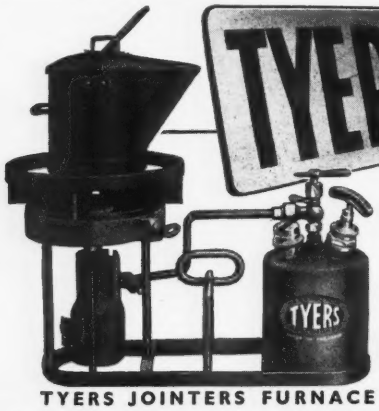

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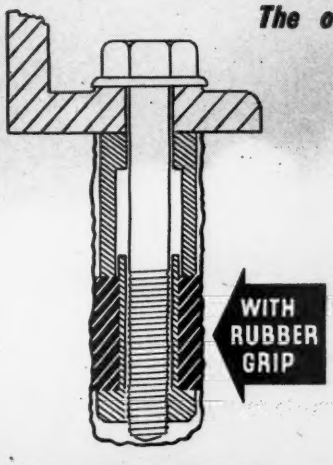

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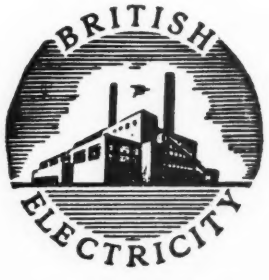

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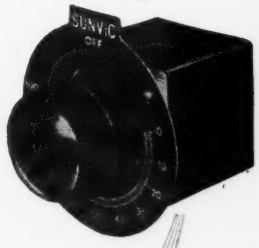

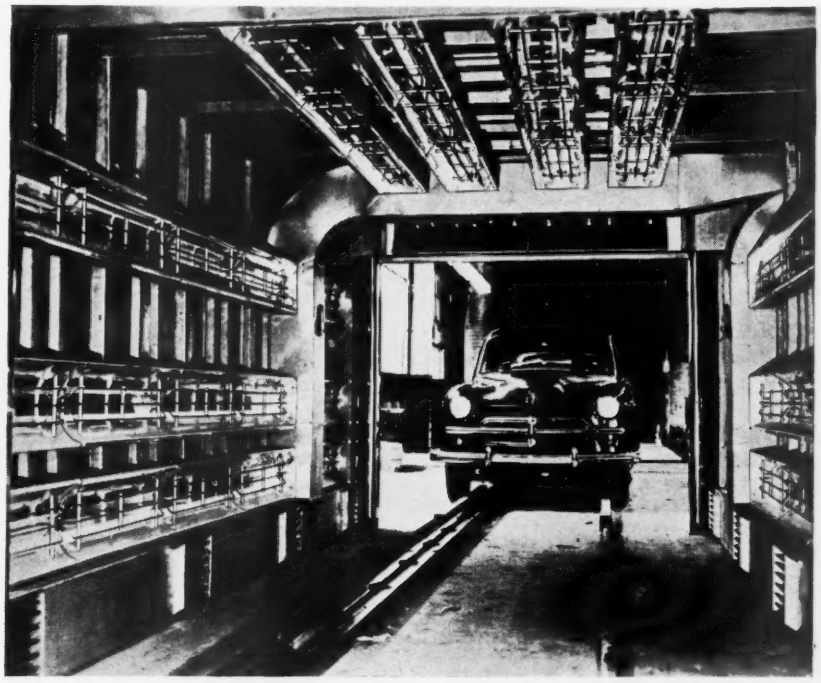

Infra Red speeds the cars. (Photo by courtesy of Vauxhall Motors Ltd. and Metropolitan-Vickers Electrical Co. Ltd.)

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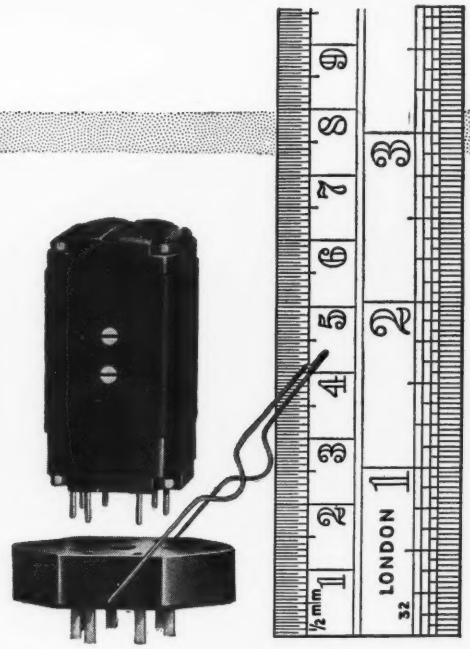
TAS/Sc. 292

Weston Miniature Moving Coil Relay



The "Weston" Model S.115 Miniature Moving Coil Relay functions as a sensitive "on-off" current switch, and will operate on a power input of only 5 microwatts. Generally the relay is supplied with a centre stable moving contact, but a biased version which affords a single break, or a break followed by a make, is also available. The moving coil can be provided with two windings which offer considerable scope in circuitry. The relay has a seven pin base and is supplied with a separate chassis or panel mounting socket with retaining clip: mounting position is unimportant. Size $1\frac{1}{2}$" x $\frac{3}{4}$" x $2\frac{1}{4}$", weight $1\frac{3}{4}$ oz. only. List No. W.46 gives further particulars and is available on request, but these relays give best service when they are specially designed to suit the circuit in which they are to be used, and we shall be delighted to co-operate on receipt of the pertinent information.

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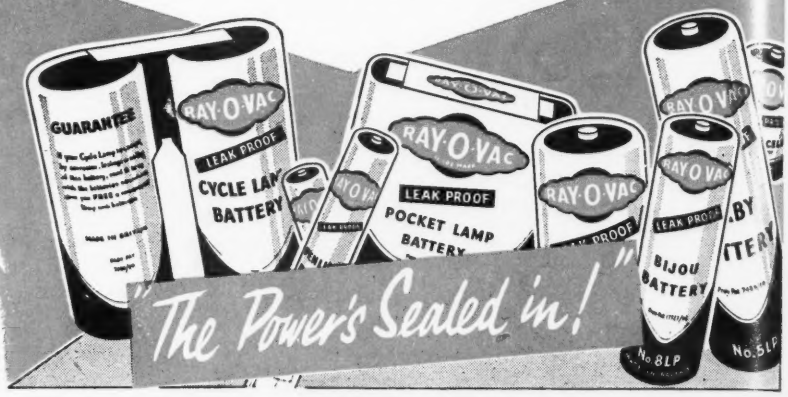

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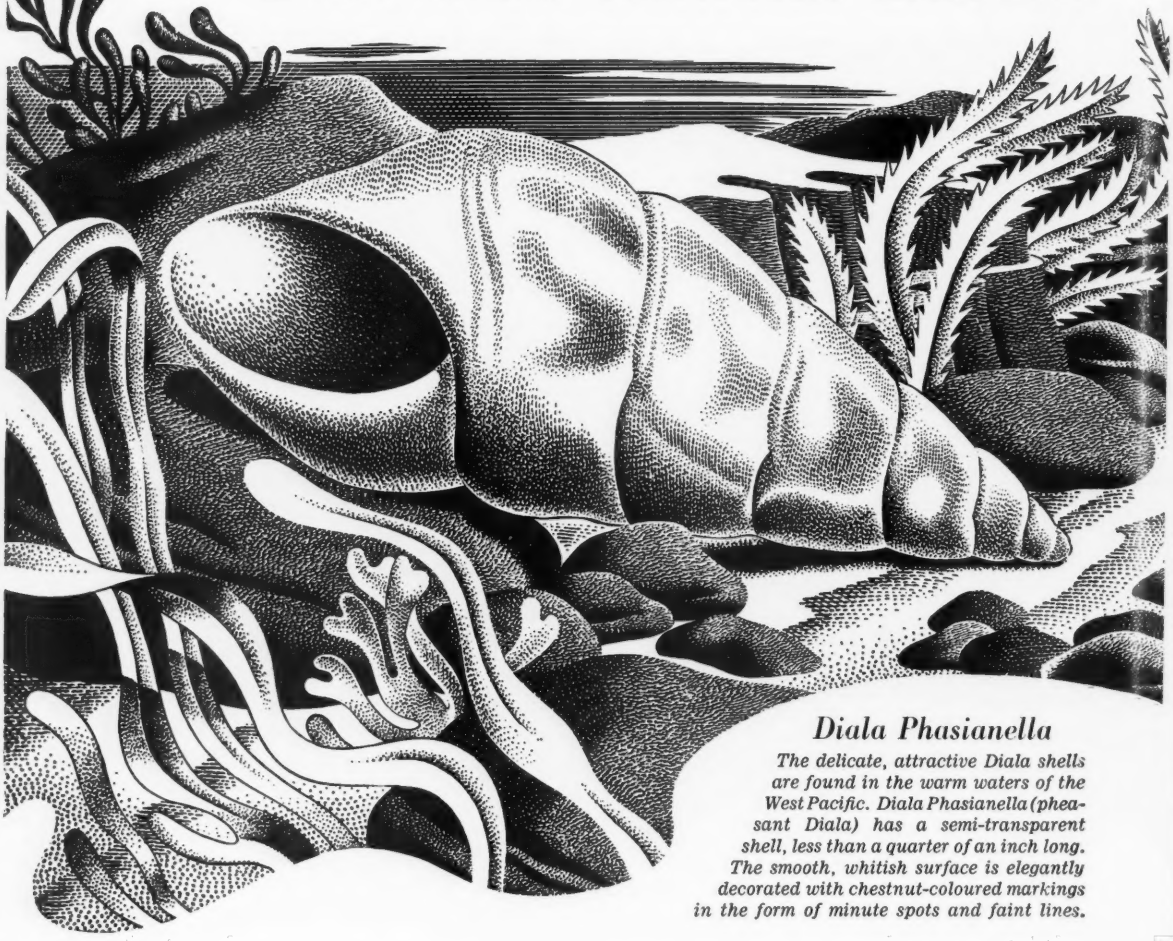

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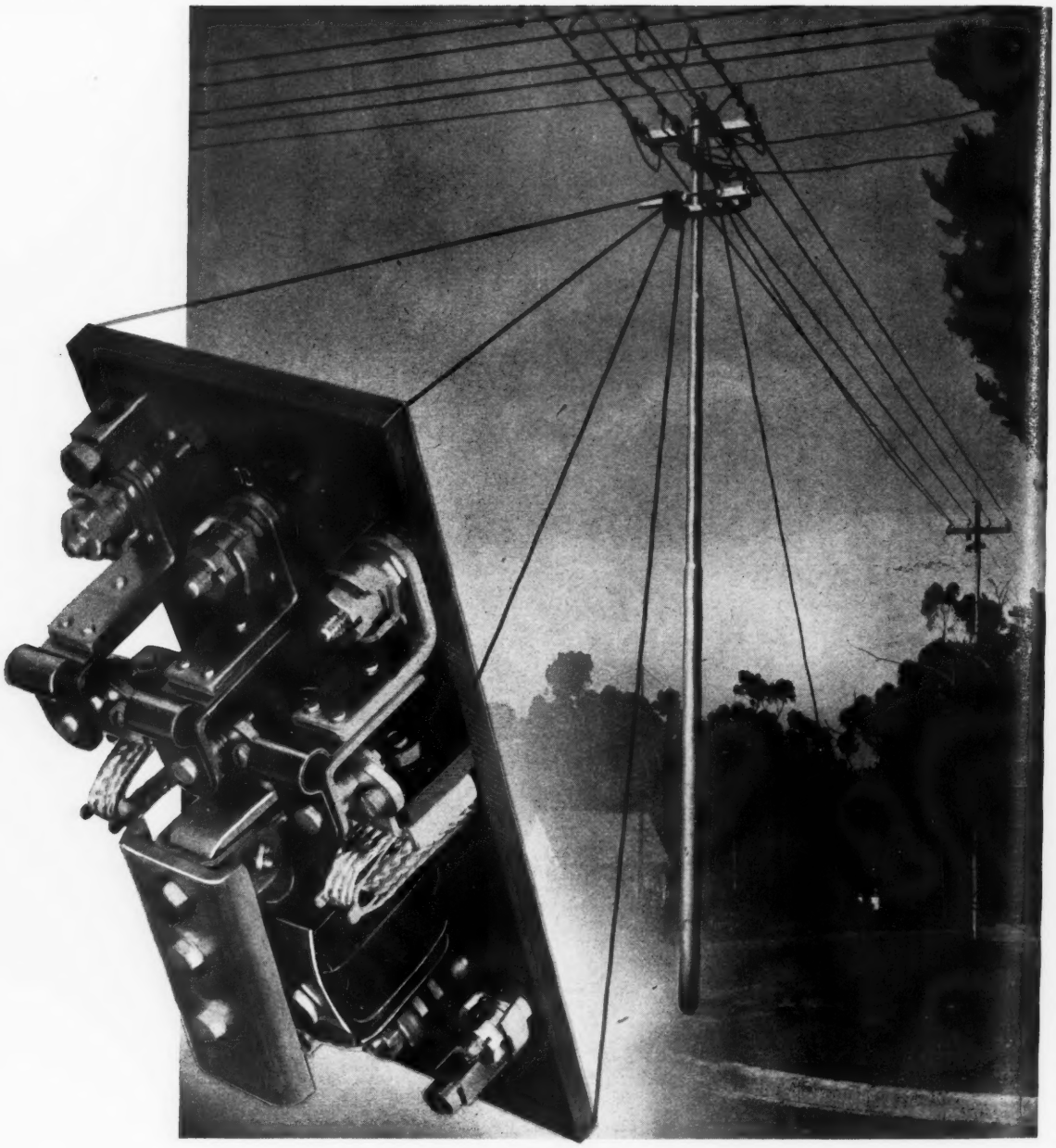

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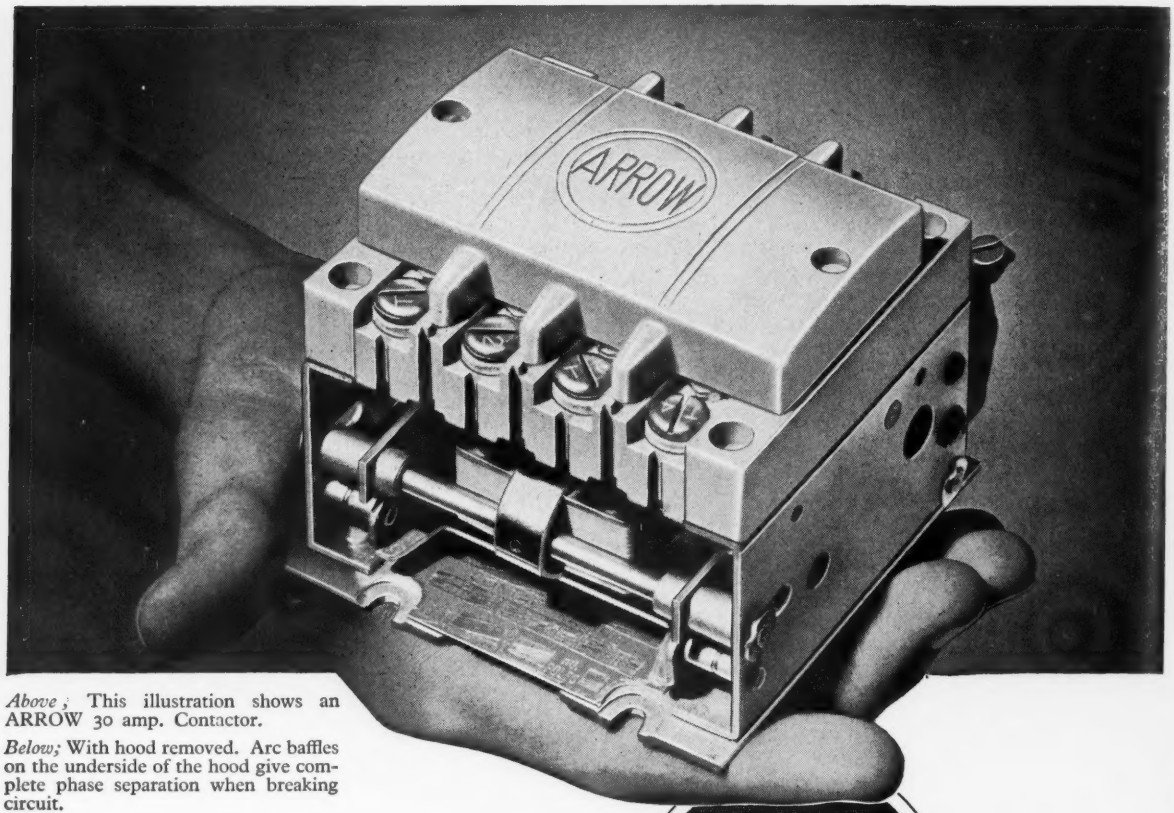
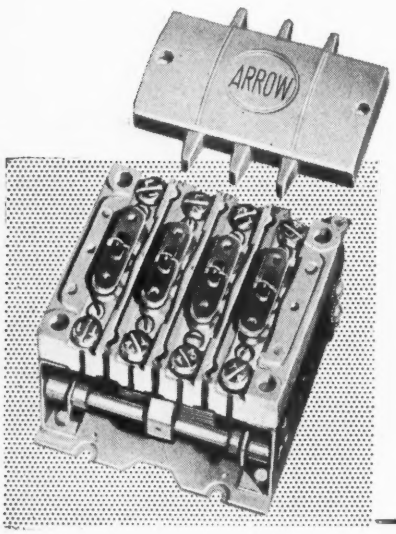


Above; This illustration shows an ARROW 30 amp. Contactor.

Below; With hood removed. Arc baffles on the underside of the hood give complete phase separation when breaking circuit.



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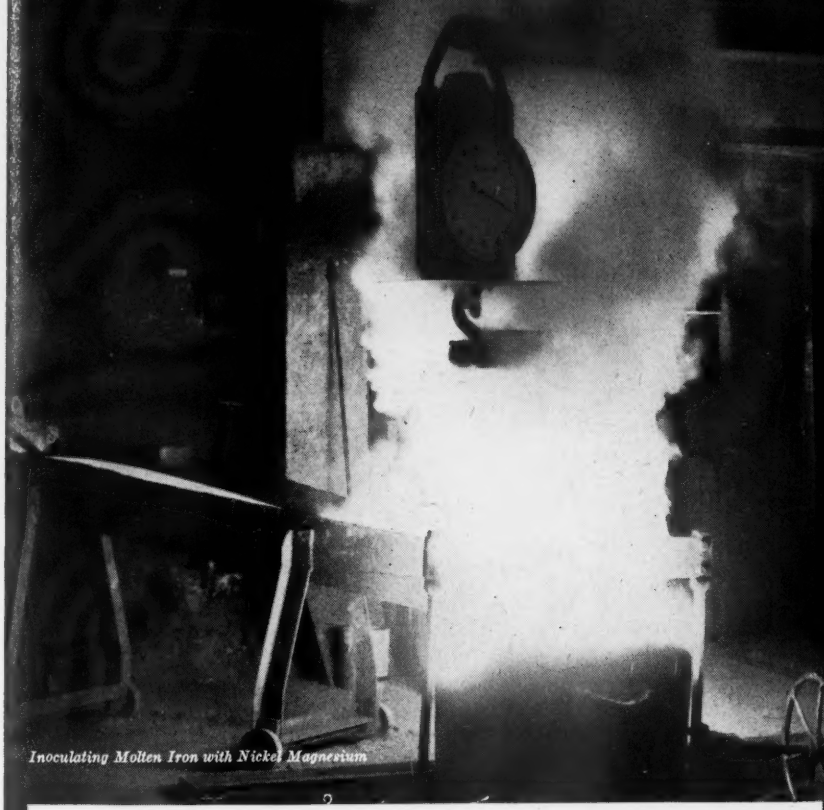
in full scale commercial production of S.G. SPHEROIDAL GRAPHITE Iron



Inoculating Molten Iron with Nickel Magnesium

The Ferranti Foundry is in full scale commercial production of S.G. (Spheroidal Graphite) Iron, including NOduMAG an austenitic non-magnetic type. Ferranti S.G. Iron with its excellent castability and remarkable physical properties has found many applications in several industries notably textile engineering, agricultural machinery and electrical engineering, in most cases showing appreciable saving in cost. Ferranti S.G. Iron can be supplied either ' as cast', fully annealed or heat treated to suit particular applications.

PHYSICAL PROPERTIES OF S.G. IRON

PROPERTY	S.G. IRON		NOduMAG
	AS CAST	*ANNEALED (FERRITIC)*	*AS CAST*
ULTIMATE TENSILE TONS/SQ. INS.	40-45	28-35	25-30
YIELD POINT TONS/SQ. INS.	25-35	20-25	18-22
ELONGATION %	3-5	20-25	10-13
REDUCTION IN AREA %	4-5	21-25	14-16

The above table shows average figures arrived at after taking independently conducted tests over a long period.

Ferranti S.G. IRON and NOduMAG are manufactured under licence from the MOND NICKEL CO.

FERRANTI QUALITY CASTINGS

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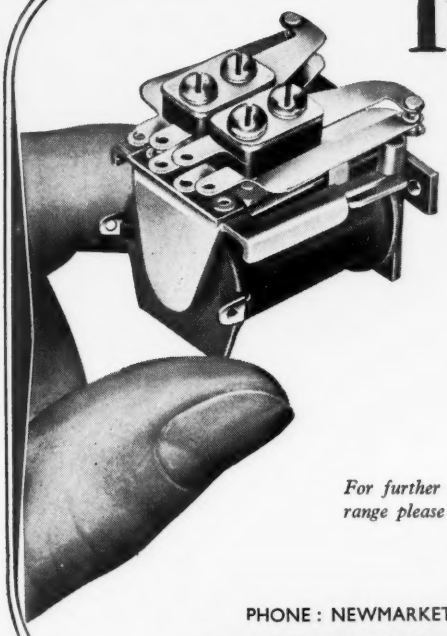

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This extremely compact relay has its connections to both contacts and coil brought conveniently to one end, and is designed without projections to facilitate close stacking where banks of Relays are in use. The contact current handling capacity is exceptionally high in relation to the overall dimensions of the Relay. Good armature design has reduced the effects of shock, vibration and acceleration, and the spring type hinge eliminates backlash friction and risk of displacement.

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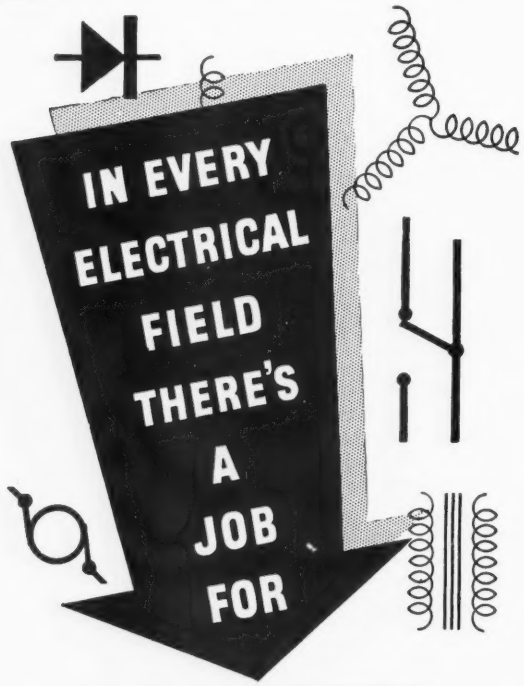

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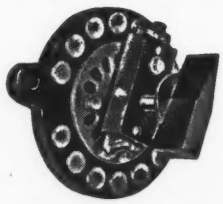

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Transformer Tapping Control
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IN 1948 J. & P. pioneered the introduction of aluminium sheathed cables with copper conductors and developed economic manufacturing processes.

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It is worth mentioning that prior to the development of the aluminium sheath the practical and economic advantages to be derived from the use of aluminium as a conductor material were negligible.

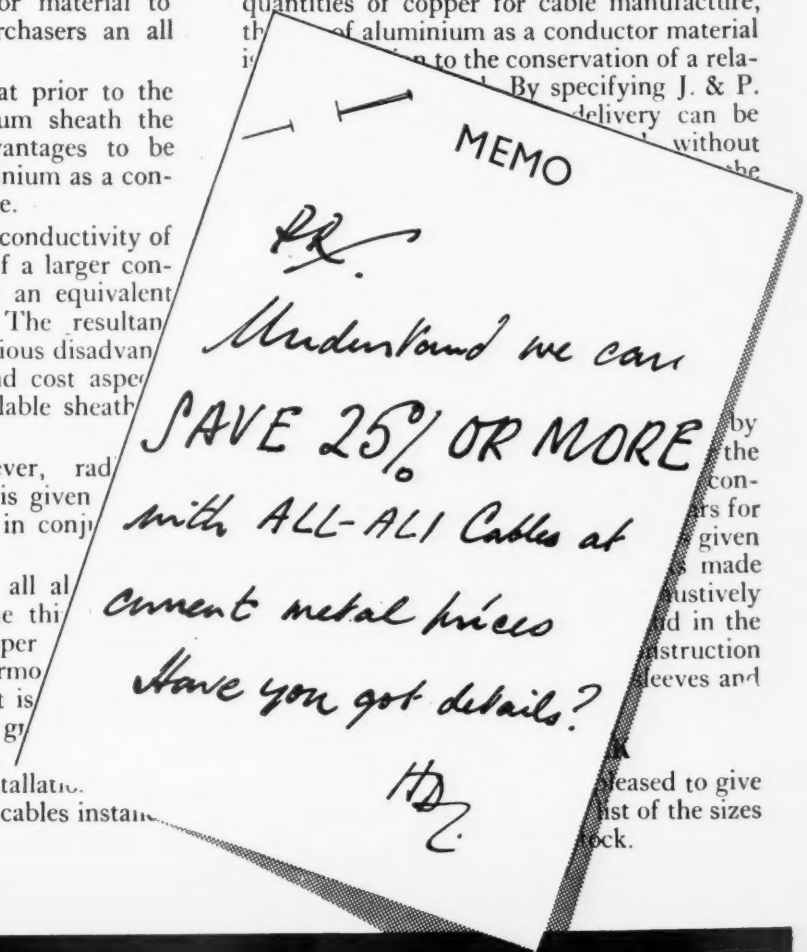
As is well known the lower conductivity of aluminium requires the use of a larger conductor than with copper for an equivalent current carrying capacity. The resultan increase in diameter was a serious disadvan age from both the weight and cost aspe when lead was the only available sheath material.

The situation is, however, rad changed when consideration is given use of an aluminium sheath in conj with aluminium conductors.

Despite its larger size, an all al cable may be as little as one thi weight of the equivalent copper lead sheathed, single wire armo Obviously the reduced weight is able advantage in all above g lations — besides facilitating transport for any type of installatio it is of special importance for cables instal in mine shafts and on ships.

Further, the aluminium conductor and aluminium sheathed cable shows in many sizes a useful price advantage over alternative types of cable.

At present, when there is some uncertainty as to the continuing availability of adequate quantities of copper for cable manufacture, th of aluminium as a conductor material i to the conservation of a rela- By specifying J. & P. delivery can be without be



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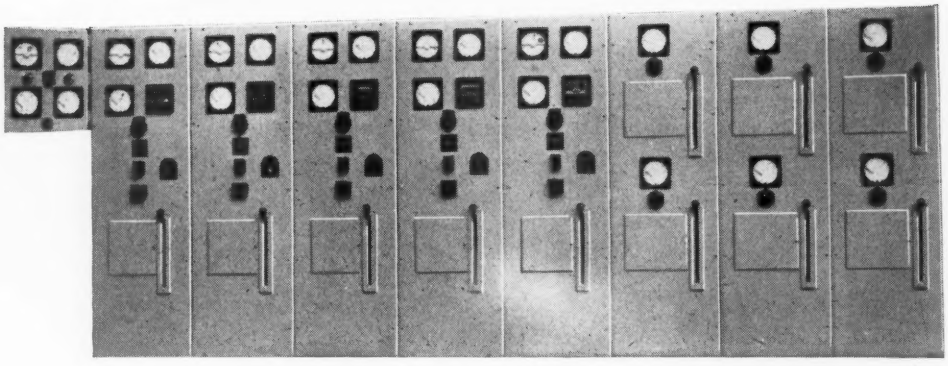

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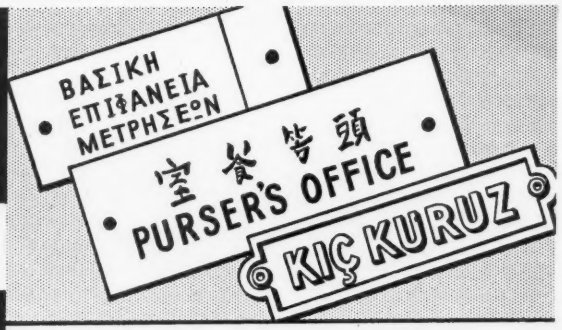

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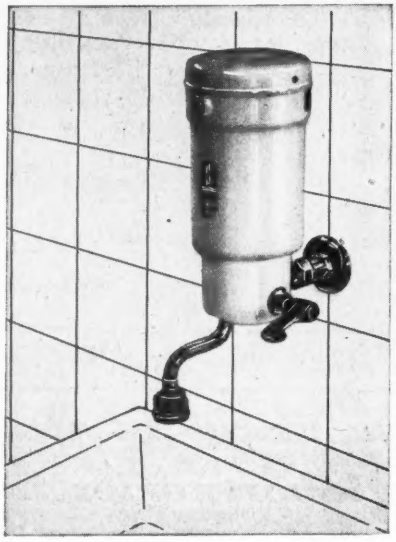

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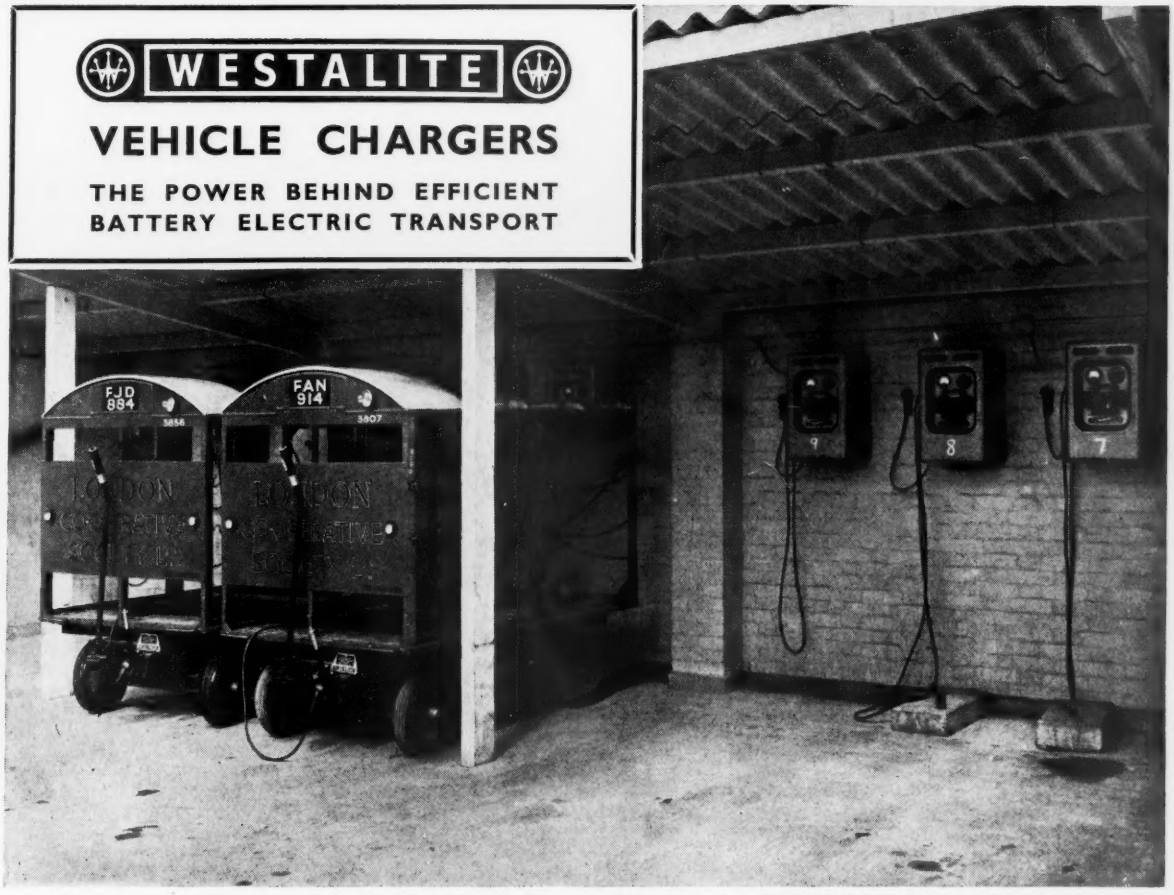

Installation of Westalite Chargers for Electruks at the Woodford Depot of the London Co-operative Society Ltd., by whose permission this photograph is reproduced

Eliminate battery failure. Install chargers that comply to all specifications laid down by battery manufacturers—Westinghouse WESTALITE vehicle chargers. They provide correct taper charging conditions at all times; with automatic cut-out by means of a relay on completion of charge.

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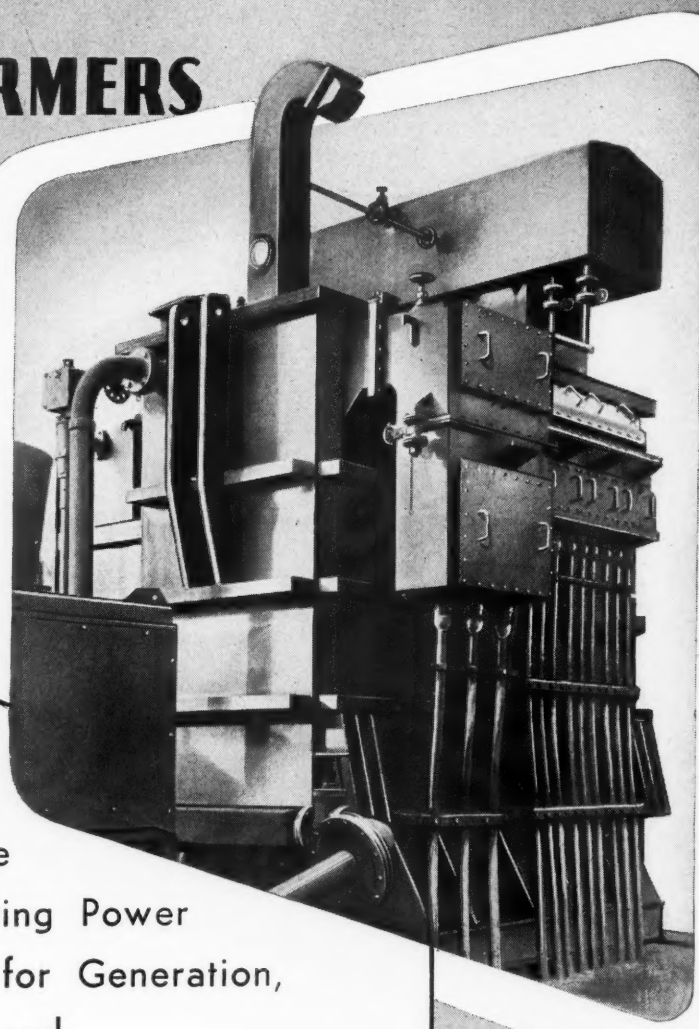

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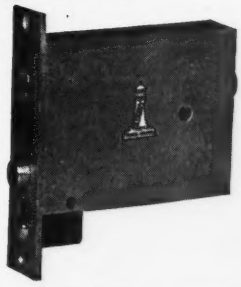

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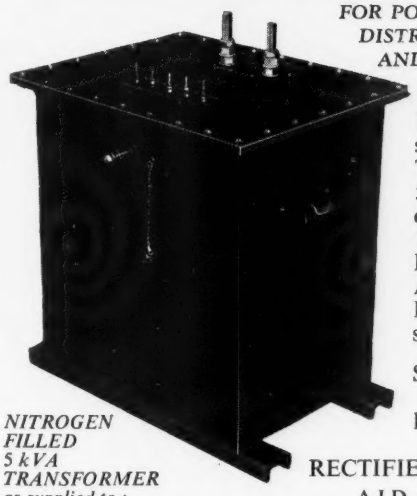

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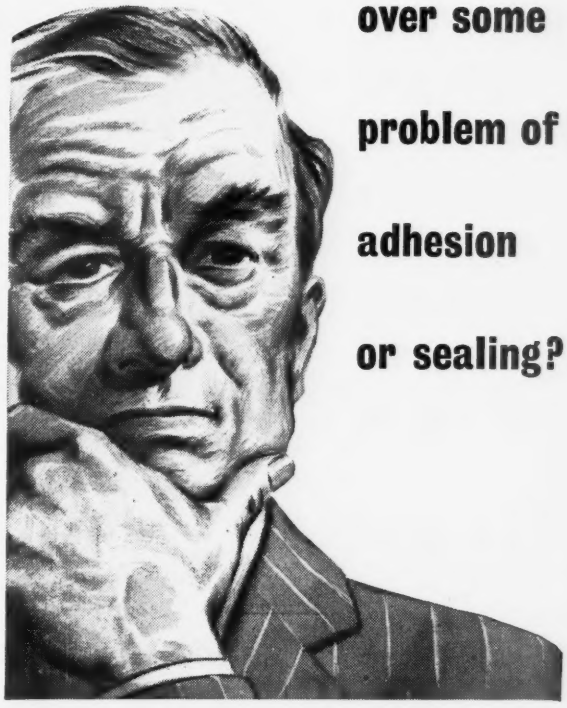

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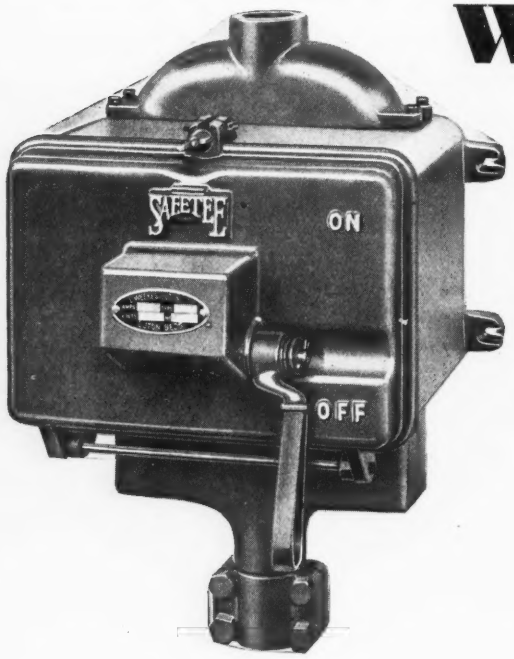

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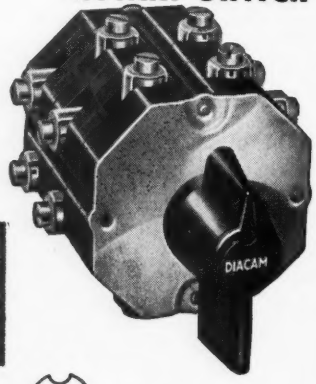

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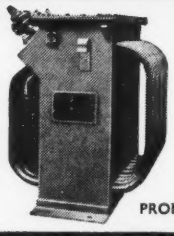

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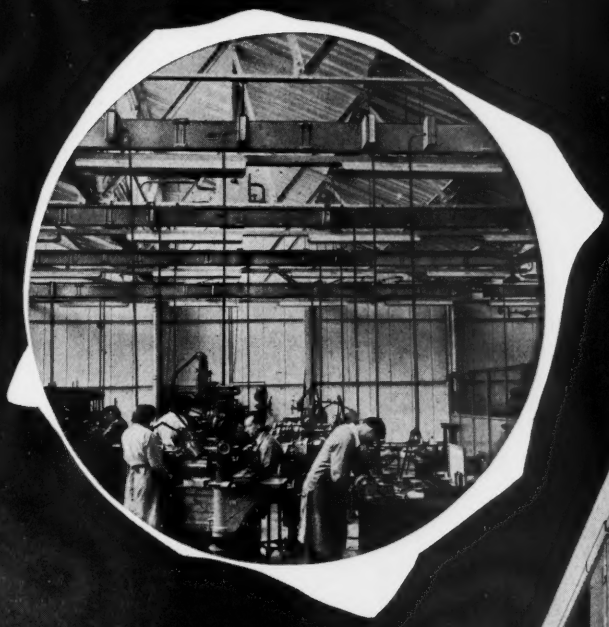

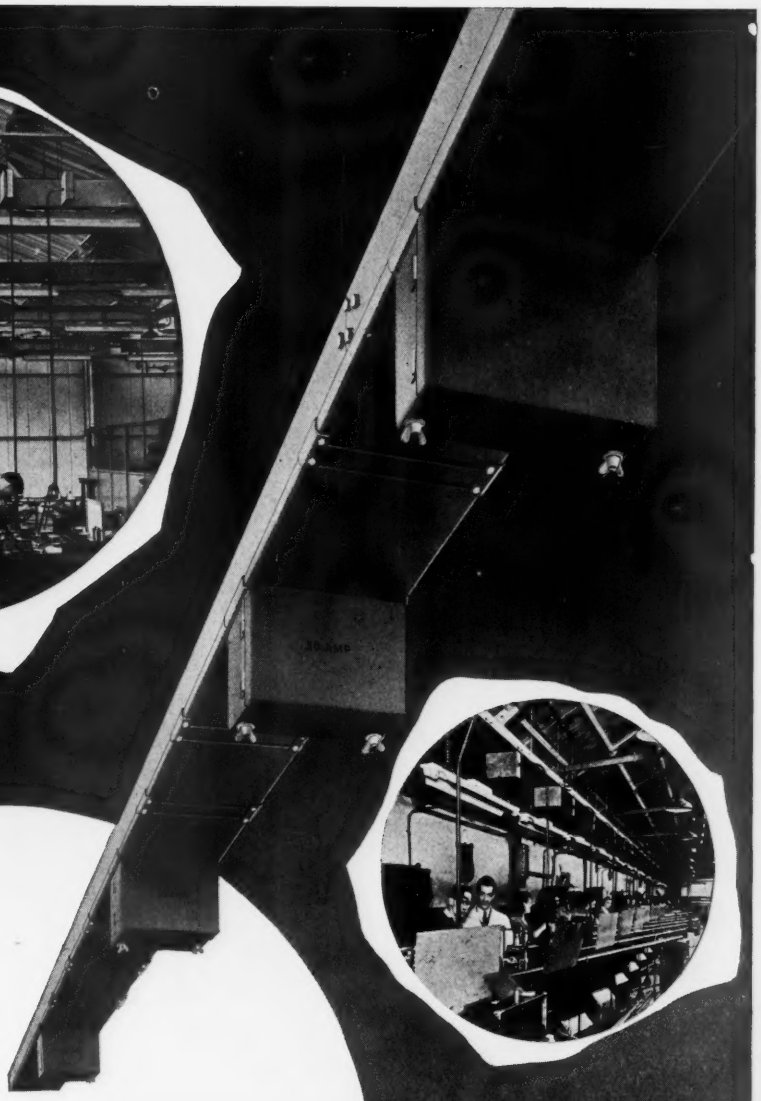

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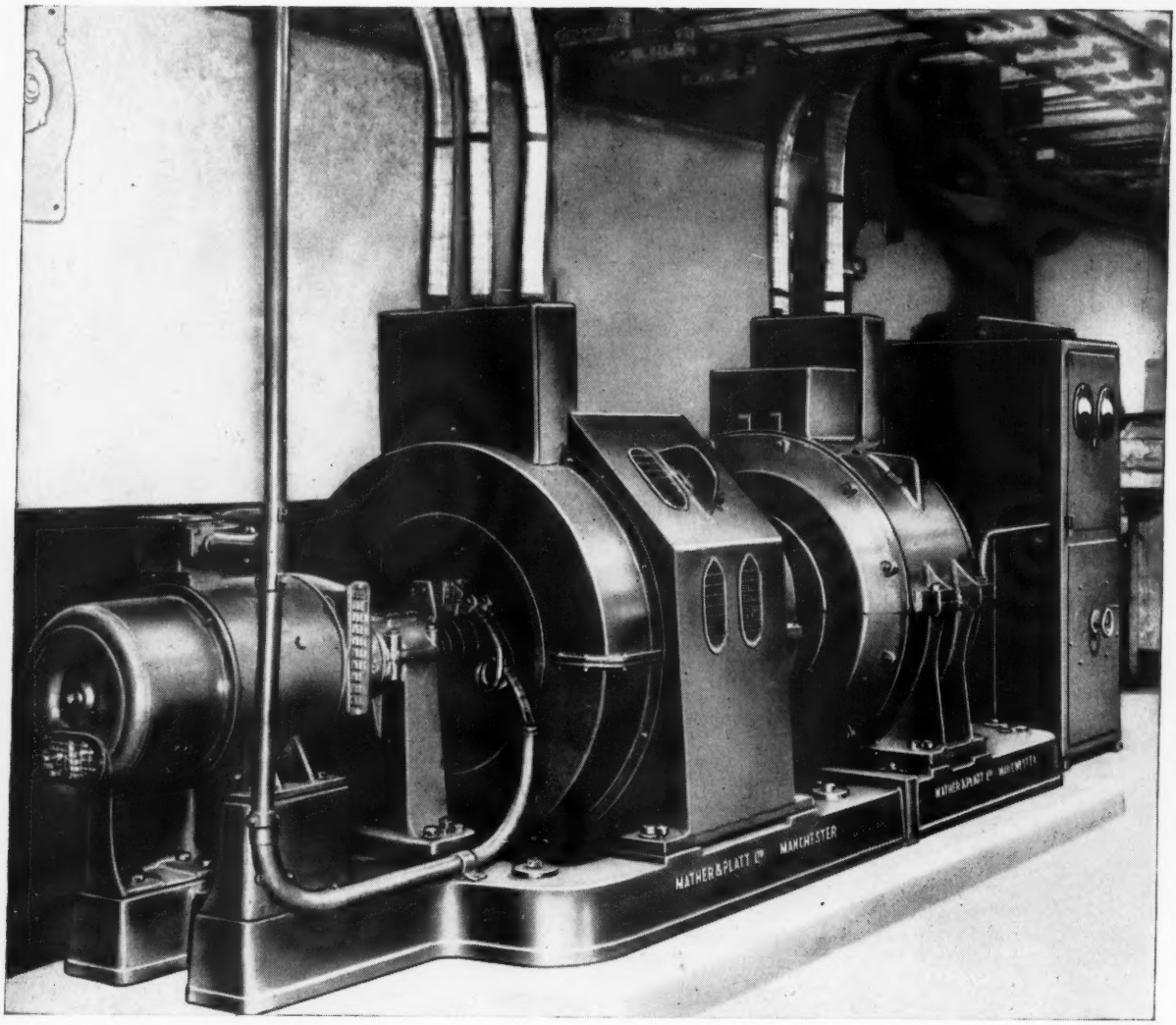

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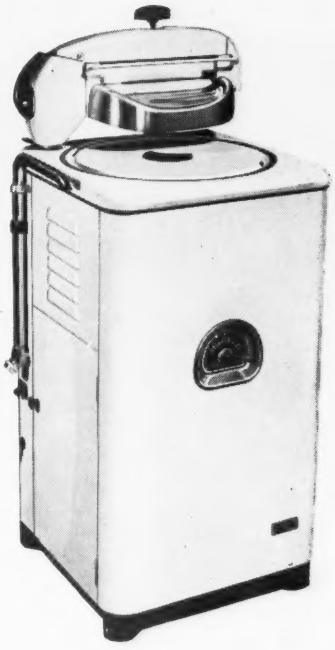

3 EFFICIENCY
The unique Parnall agitator provides a scientific water-action that *really* gets clothes cleaner.

4 EASE OF OPERATION
Standard sink height obviates stooping. Power washing, wringing and emptying mean less exertion.

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In addition to carrying the seal of the Good Housekeeping Institute the Parnall has our own twelve months' guarantee, most generously interpreted: plus nation-wide service organization.

6 PRICES:
Such value for money at £65.2.0 (or £75.12.0 with own heating element)—no wonder Mrs. Brown is selling for you! Wherever there's a Parnall User, she's busy telling her friends to buy one.

P.S *And don't forget that the Parnall is supported by* consistent *nation-wide advertising, displays, showcards, leaflets and demonstrations at Exhibitions — with enquiries passed to YOU!*

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WITH THE AMAZING SPEEDHEAT OVEN!

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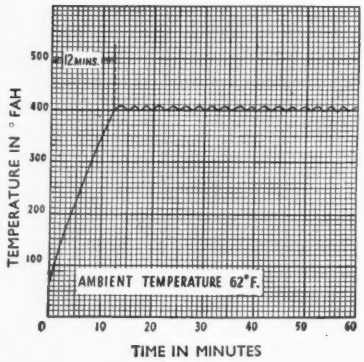

The graph alongside shows that a temperature of 400°F is reached from an ambient temperature of 62° in **only 12 minutes.**

Yes, this new "Luxury" C.90 will be a quick seller—particularly when the purchaser knows that an exclusive Pyrex heat-resisting glass casserole/grill pan, a heated drawer, and an 8" radiant plate with simmer control are all included for the moderate price of £48.

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Crompton Parkinson KLOSD type squirrel cage motors up to 25 h.p. now conform to B.S. No. 2083 "Dimensions of 3-phase electric motors" and may be used to replace any other makes in the same category. They also conform to B.S. 168 for electrical performance. But, as in every other kind of swop, one of the parties usually gets the better of the deal, and the manufacturer who changes to Crompton Parkinson KLOSD motors will find he has a precision job with a quality of workmanship and a length of life that is second to none.

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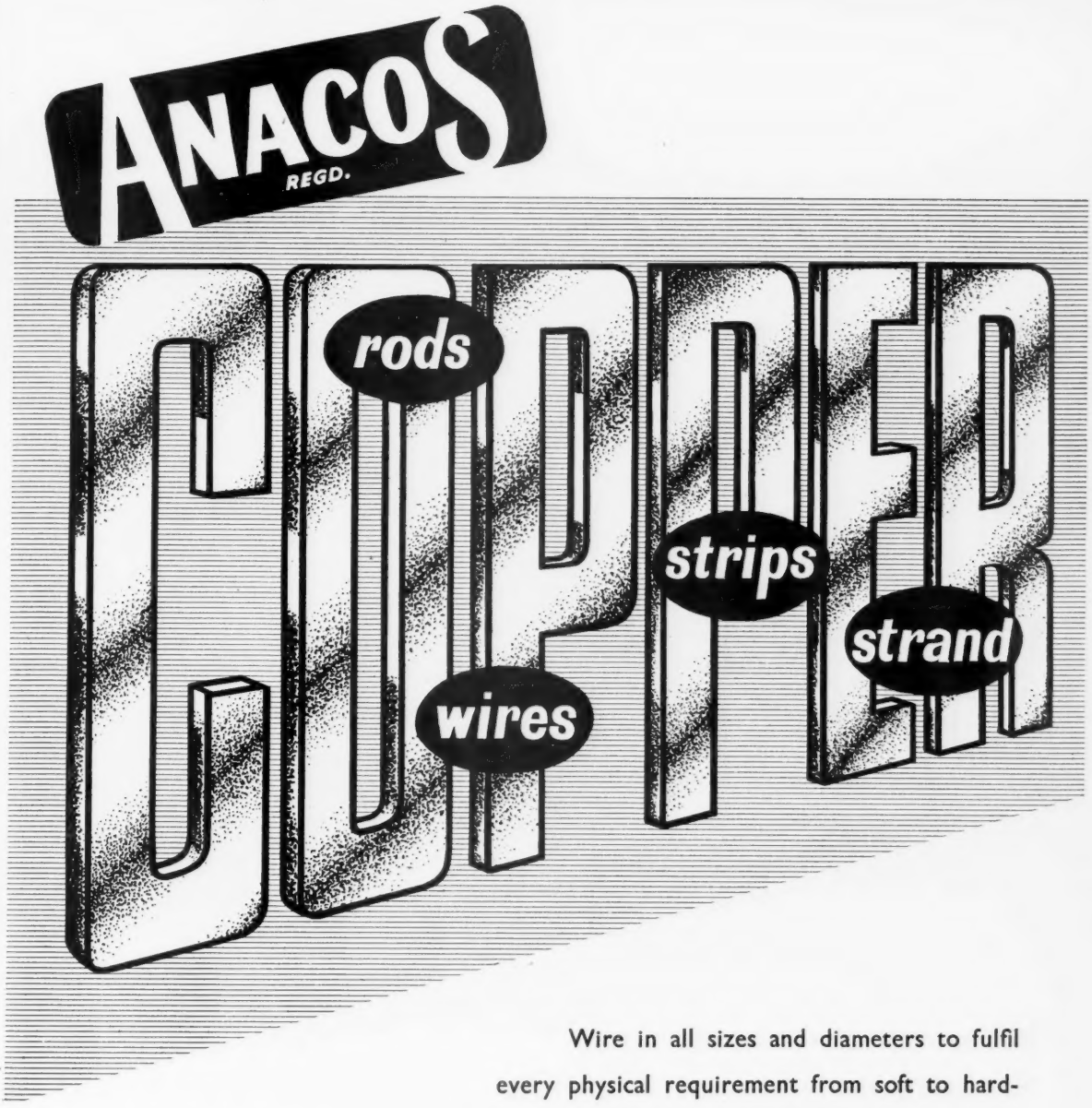
EL 7



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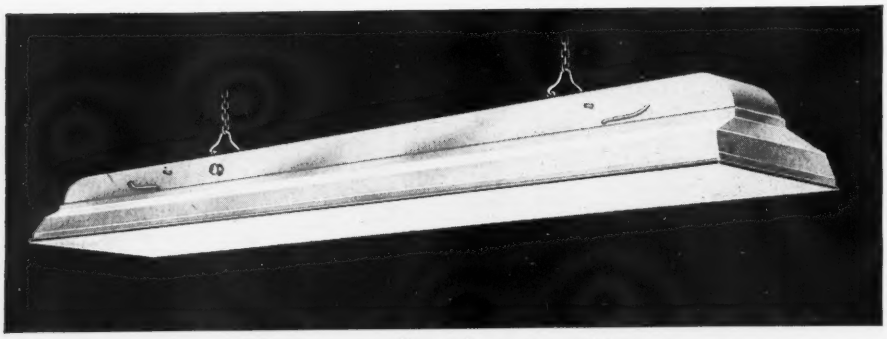
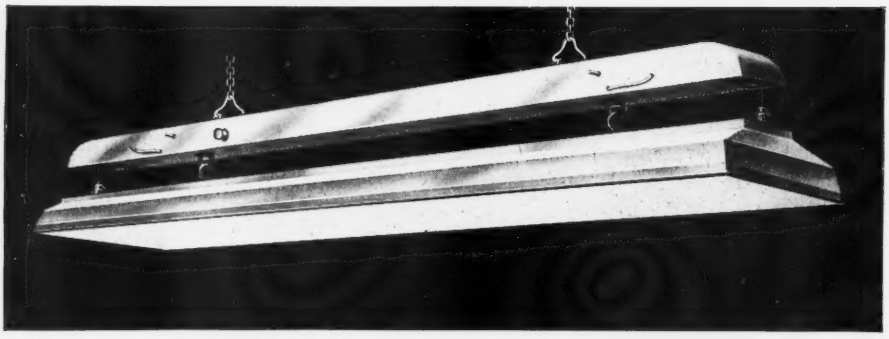
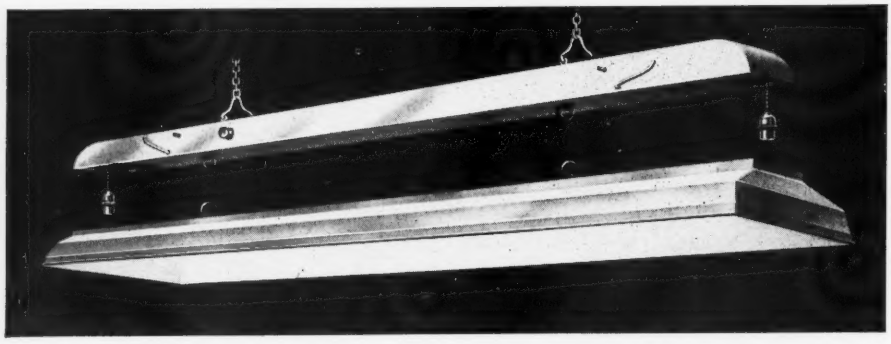
FOR ONE OR TWO 80-WATT LAMPS



Vitreous enamelled reflector in position.



Vitreous enamelled reflector ready to be unhooked. Lampholders disconnected. Trough with lamp lifted off hook by one man.



Vitreous enamelled reflector removed for cleaning. Trough and lamp taken off in one journey up the ladder in half the usual time.

Note: No live wires or terminals exposed.

With switch type or instant start gear.

With slots for upward light.
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With Transverse Louvre if desired.

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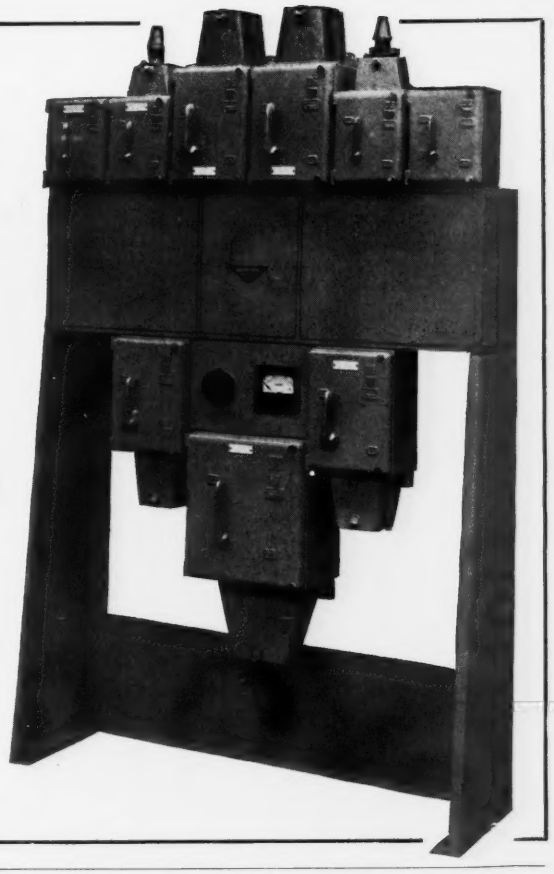

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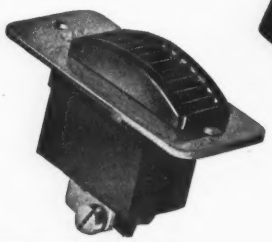

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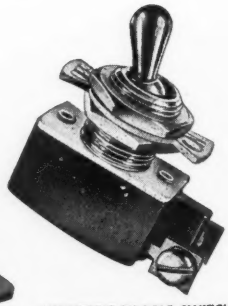

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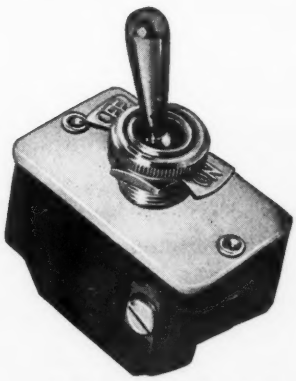

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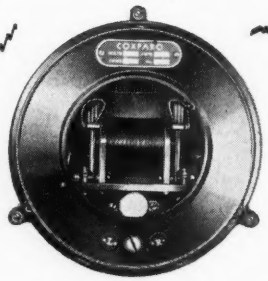

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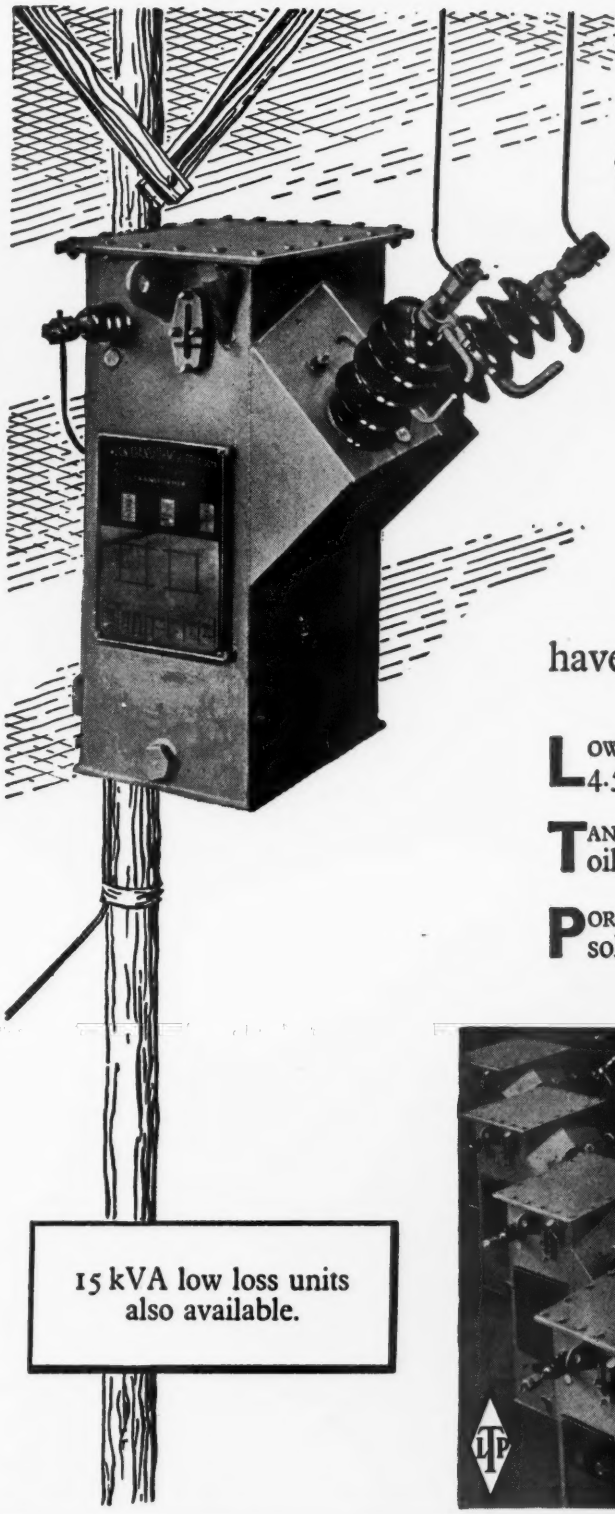

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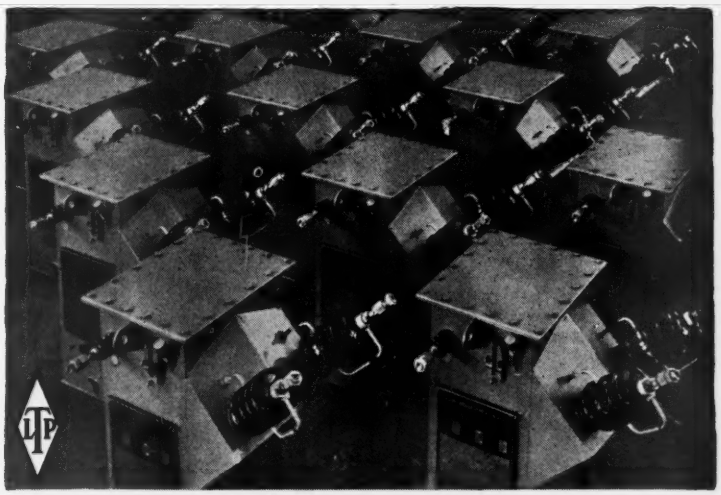

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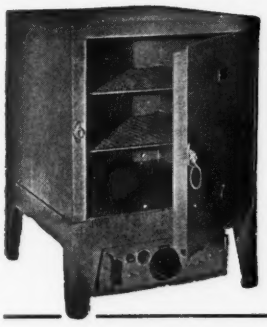

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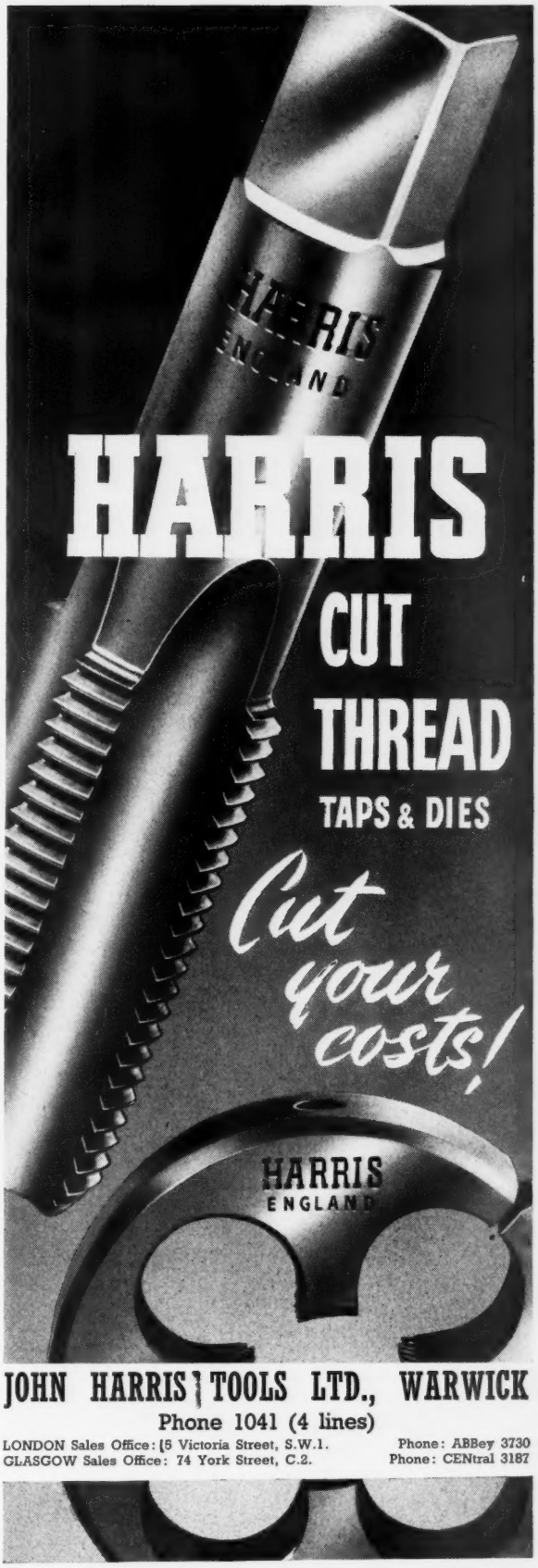

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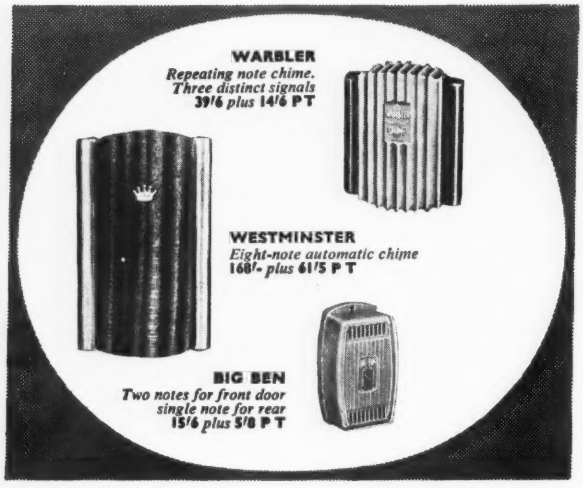
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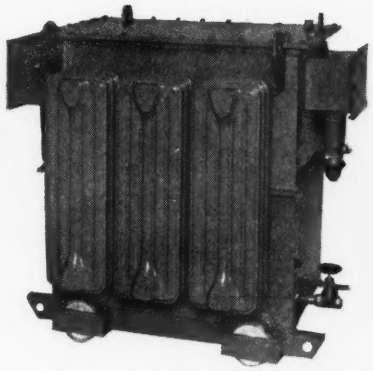

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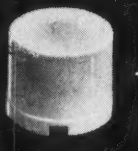

Fig. 384
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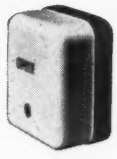

Fig. 1139 TRANSFORMER*
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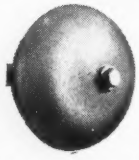

Fig. 1065 UNDERDOME BELL
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These products mean Business — our Domestic models are contained in attractive "fast selling" packs.

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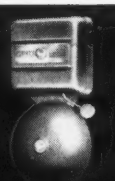


Fig. 145 METALCLAD BELL
Very popular Industrial Bell. Models for Battery, A.C. or D.C. up to 250 v. Dome, Sheep or Church gongs in Steel or Bell metal.
Prices on application.

*An entirely new transformer ideally suited for Industrial and Domestic applications. Sheet steel cover stove enamelled cream with black plastic base. Fused secondary.

GENTS' OF LEICESTER

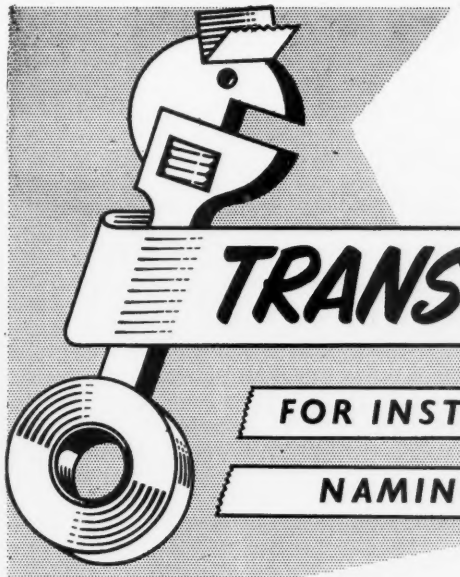
ELECTRICAL PRODUCTS

GENT & COMPANY LIMITED · FARADAY WORKS · LEICESTER

Manufacturing Electrical Engineers since 1872.

London Office and Showrooms: 47 Victoria Street, S.W.1. Also at: NEWCASTLE · BIRMINGHAM · BRISTOL & GLASGOW

Other products include: INDICATORS · FIRE & BURGLAR ALARMS · LUMINOUS CALL SYSTEMS · STAFF LOCATORS
CONTROLLED ELECTRIC CLOCK SYSTEMS · TIME RECORDERS, ETC.



The wide diversities of engineering find ever-growing scope in

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Every business can profit by using quick, clean, attractive Transoprint. Send for specimens and see how usefully you can apply this modern medium to your own problem and purpose.

JOHN GOSHERON & CO LTD GAYFORD ROAD LONDON W12

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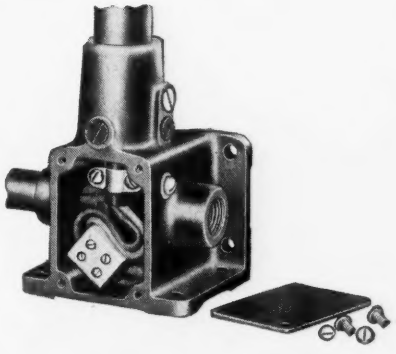
MEKELITE

GEARED JOINT

INDUSTRIAL LIGHTING UNITS

Catalogue sent free on request



Type W2803 can be supplied with 18 in. pillar as illustrated or with short vertical pivot. It is suitable for mounting on horizontal or vertical surfaces, or clamping to vertical tube (1 in. gas). Screwed conduit entries on both sides and clearance hole in bottom with "knock-out." Alternative cover incorporating switch with protection for dolly.

Various lengths of arm (maximum horizontal reach 54 in.). Many other bases and six sizes of reflector.

MEK-ELEK Engineering Ltd., 17 Western Road, Mitcham, Surrey

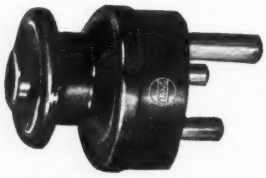
Phone: MITcham 3072 Cables: Mekelek, London

CLANG

Registered Trade Mark
LTD.

BY POPULAR DEMAND !

THE *NEW* 5 AMP
EJECTOR PLUG



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Manufacturers of over 300 different

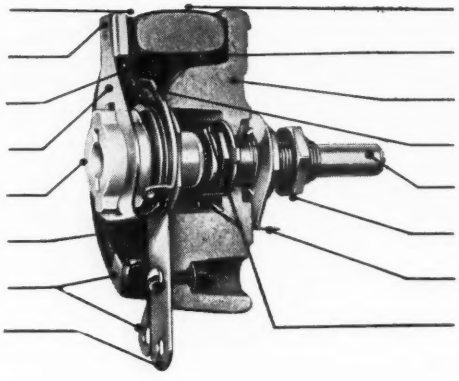
Electrical Accessories

CRICKLEWOOD, LONDON, N.W.2

Phone : GLADSTONE 4201 P.B.X.

THERE ARE SIXTEEN WAYS OF LOOKING AT...

1 Silver graphite brush contact
2 Balance point for self-aligning brush
3 Pig tail shunting brush arm
4 Nickel silver brush arm
5 Glazed porcelain brush arm insulator
6 Winding welded to terminal band
7 End contact band and terminal
8 Brush terminal



9 Winding embedded in vitreous enamel
10 Vitreous enamel bond between former and base
11 All ceramic construction withstands 5000v. flash test
12 Non-grooving return contact plate
13 Stainless steel spindle available in wide range of lengths
14 Electro tinned mounting bush, nut and spindle bearing
15 Panel locating-washer to prevent rotation of assembly
16 Stop on shaft engages pressing in base moulding groove.

...BERCO TOROIDAL RHEOSTATS

All units arranged for panel mounting—protected type units availab e for e ther back or front of board mounting—two or more units can be ganged together for special networks and where space is limited. For full technical details and prices, ask for List 613A.

THE BRITISH ELECTRIC RESISTANCE CO. LTD

QUEENSWAY, PONDERS END, MIDDLESEX. Telephone: Howard 1492

Telegrams: Vitrohm, Enfield. *Pioneers of the toroidally wound power rheostat in England*

BERCO

BB1211-AH

All clear for the 8.30...

Wherever trains run, electricity plays a part . . . electric traction systems rely on faultless cables . . . and steam trains too depend on cables for automatic signalling . . . cables which have been specially developed by members of the Cable Makers Association.

By close technical collaboration among its members, the C.M.A. has pioneered the most important developments in electric cable making. That same collaboration makes possible the exceptionally high standards for all types of C.M.A. cable—and safeguards every user.

SPECIFY C·M·A CABLES

The 'Roman Warrior' and letters 'C.M.A.' are British Registered Certification Trade Marks

CABLE MAKERS ASSOCIATION, 52/54 HIGH HOLBORN, LONDON, W.C.I

HOSE CLIPS
for all purposes

7 Springfield Street Warrington *Warrington 2390*	102 Abbey Street Accrington *Accrington 2774*
25b Winckley Square Preston *Preston 5068*	65 Marmion Road Southsea *Portsmouth 74908*

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& Co. Ltd.
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TRANSFORMERS
for Distribution and Industry

- ★ RECTIFICATION
- ★ PHASE CONVERSION
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- ★ FURNACES
- ★ ARC WELDING
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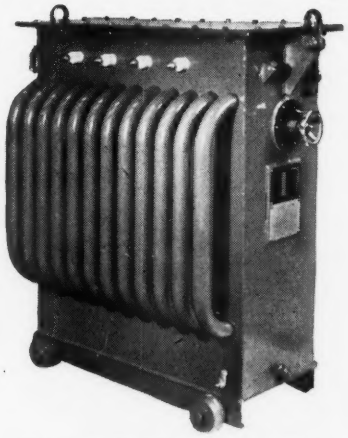
Ratings up to 250 kVA



75 kVA, 400/200-600 V, 3 phase testing Transformer with off load tapping switch

S.T.L. Transformers are widely used in industry where reliable units are required for continuous duty

STEWART TRANSFORMERS LTD.
Kilburn Lane London W.10 Tel. LADbroke 2296/7

what

Making copies of plans and drawings has always had its snags—such as slow, messy processes, the need for elaborate installations and skilled operators, high cost per copy, and fading. AZOFLEX has none of these — literally none. The efficiency and economy of this process is amply demonstrated by the large and growing number of industrial commercial and professional organizations now using AZOFLEX exclusively for all their copying work.

engineers

AZOFLEX is above all a simple process. It calls for no technical skill, no special lighting, no running water and drainage services ; it creates no mess or unpleasant smell — yet every user finds that it improves the quality of copies and enormously speeds up output. It produces intense-line, fade-resisting facsimiles of drawn, typed or printed originals of all kinds — single or double sided, translucent or opaque.

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In the combine Printing and Developing Machine (Model 42/63) illustrated here, for example one *unskilled* operator need only feed the original and the copying material into the machine in order to produce the finished print, dried, flat, and ready for trimming and collating. Exposing, developing and print delivery are completely synchronized.

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To meet individual photo-printing needs there is a useful range of precision-built AZOFLEX printing and developing machines, and a wide variety of AZOFLEX photo-printing materials, all distinguished by long shelf life, intense line and resistance to fading — and all of them easy to handle and process.

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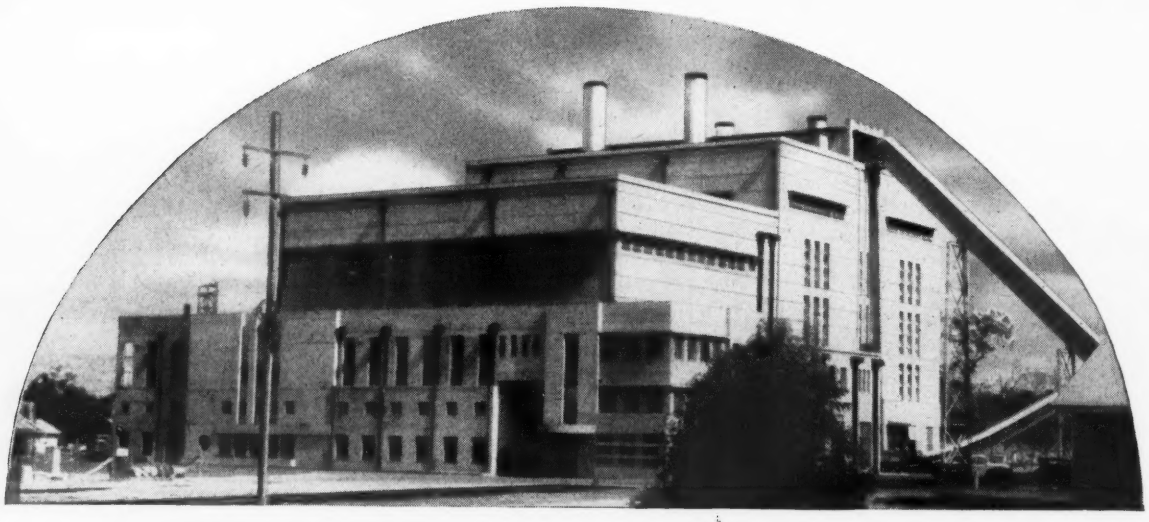
AZOFLEX machines and materials are backed by all the photographic experience and skill of Ilford Limited, and AZOFLEX papers are produced in the world's most up-to-date diazo coating plant.

ILFORD *Azoflex*

For descriptive literature about AZOFLEX machines and materials, please apply to Ilford Limited, Azoflex Department AZ1H, 104 High Holborn, London, W.C.1 (Telephone: HOLborn 3401). Demonstrations of the Azoflex process can be seen at this address and also, by appointment, at Ilford Limited, 22 Lloyd Street, Manchester 2 (Telephone: Deansgate 4233) and in other principal cities.

PHOTO·PRINTING MACHINES AND MATERIALS

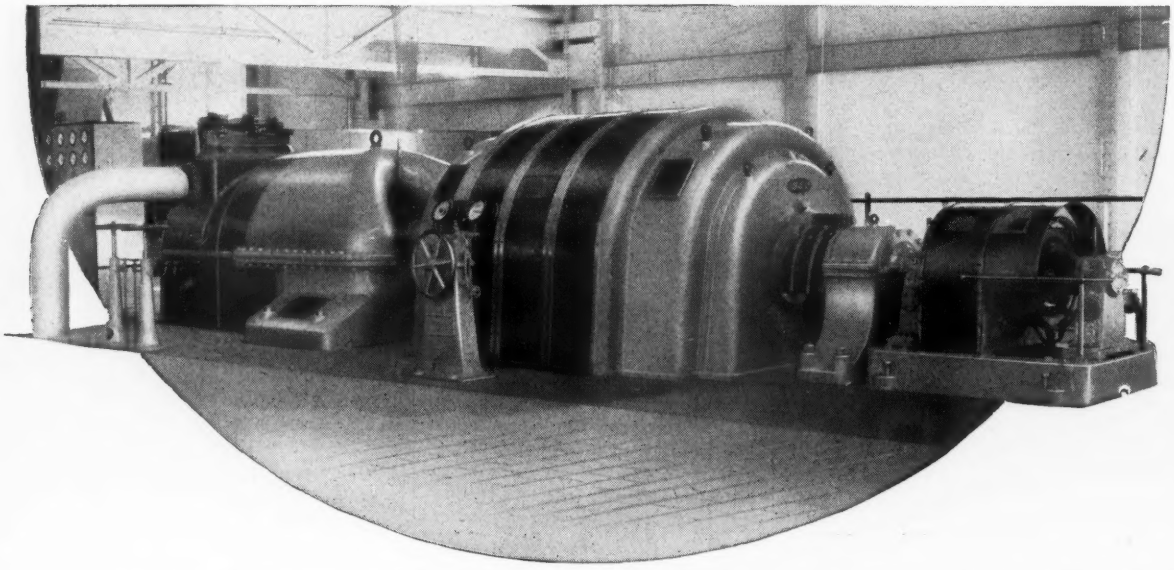
G



G.E.C.

TURBO-ALTERNATORS IN QUEENSLAND

A 7.5 MW, 11 kV, G.E.C. Turbo-alternator in the Howard Power Station, Queensland, Australia, where three sets of this rating are in service.



THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number this counts as two words and carries an additional charge of 1/-.

DISPLAYED:—£2 per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF CLEETHORPES

Beacon Hill Housing Site No. 6
Sandringham Road Housing Site No. 7
Trinity Road Housing Site No. 8

Electrical Installations in 70 Dwellings

TENDERS are invited from Electrical Contractors for the complete wiring installation for the following dwellings:—

BEACON HILL HOUSING SITE No. 6.
(a) Eight Type L Dwellings in Four Pairs.
(b) Eight Type K Dwellings in Four Pairs.
(c) Four Cottage Flats in One Block.

SANDRINGHAM ROAD HOUSING SITE No. 7.
(a) Six Type J Dwellings in One Block.

TRINITY ROAD HOUSING SITE No. 8.
(a) Forty-four Type K (Modified) Dwellings in Twenty-two Pairs.

The Council are prepared to receive tenders for the execution of the work for the whole of the above dwellings or in part as scheduled above. The work will be carried out under a sub-contract to the main building contract.

Specifications, forms of tender and all relevant information may be obtained from A. B. Cooper, Borough Engineer, Council House, Cleethorpes, on receipt of a deposit by cheque for two guineas, made payable to the Cleethorpes Corporation, such deposit to be returned on receipt of a bona fide tender.

Tenders in official sealed envelopes must reach the undersigned not later than 12 o'clock noon on Monday, 15th November, 1954.

The Council do not bind themselves to accept the lowest or any tender. They also reserve the right to accept one or more tenders, or any tender, in part or whole.

G. SUTCLIFFE,
Council House, Town Clerk.
Cleethorpes.
25th October, 1954. 5788

DURHAM COUNTY COUNCIL

Education Committee

THE Education Committee is prepared to receive sole tenders from Electrical Engineers for the following works:—

Annfield Plain Modern School—Electrical Installation.
Seaham Harbour Deneside County School—Electrical Installation.
Sedgefield County School—Electrical Installation.
Trimdon Grange County School.—Electrical Installation.
Washington Biddick County School—Electrical Installation.

Applications for the forms of tender and specifications of work are to be sent to G. R. Clayton, Esq., F.R.I.B.A., County Architect, Court Lane, Durham, not later than the 6th November, 1954.

No pledge is given to accept the lowest or any tender.

J. K. HOPE,
Shire Hall, Clerk of the County Council.
Durham.
20th October, 1954. 5771

CLASSIFIED ADVERTISEMENTS ARE PREPAID

COUNTY BOROUGH OF DUDLEY

Street Lighting Cable, Trunk Road A.4123, Second Section

APPLICATIONS to tender are invited for the provision and laying of a 4-core Street Lighting Cable approximately ¾ mile length on A.4123, together with the provision of 36 connections to proposed street lighting points.

Applications should be made to the Borough Engineer, The Council House, Priory Road, Dudley, Worcs, on or before the 1st November, 1954, and should be accompanied by a cheque for £5 5s., which will be returned on receipt of a bona fide tender not subsequently withdrawn. Contract documents will be forwarded as soon as possible after that date and tenderers will then be informed of the latest date for receipt of tenders.

P. D. WADSWORTH,
Council House, Town Clerk.
Dudley.
14th October, 1954. 5669

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the Local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage for posts (a).

(a) ASSISTANT MAINTENANCE ENGINEER (MECHANICAL), HACKNEY GENERATING STATION (Vacancy No. 54/884). Candidates should have served an apprenticeship and be experienced in the maintenance of turbines, boilers and other mechanical plant. Salary Class F, Grade 9 = £637 7s. per annum.

(a) SHIFT CHARGE ENGINEER, STEPNEY GENERATING STATION (Vacancy No. 54/885). Sound electrical and mechanical training necessary with experience in efficient operation of generating station. Character and ability to deal with staff problems is important. Salary Class F, Grade 7 = £731 17s. p.a.

SECOND ASSISTANT ENGINEER (COMMUNICATIONS SECTION), TECHNICAL DEPT., DIVISIONAL HEADQUARTERS (Vacancy No. 54/886). The successful candidate will be directly responsible to the Technical Engineer for the construction, testing and maintenance of a private communications system owned and maintained by the Authority, using line, teleprinter and radio equipments and techniques. Previous experience on this class of apparatus is essential and telephone manufacturer's works experience desirable.

Adequate administrative experience is essential, and preference will be given to candidates who have a university degree, preferably in physics or light current electrical engineering. Corporate membership of the I.E.E. or the Inst. of Physics is also desirable. Salary within Class AX/EX, Grade 2 = £875 14s. to £1,113/£1,133.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 14 days of this advertisement. 5786

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Northmet Sub-Area:—

SUB-AREA HEADQUARTERS, SOUTHGATE, LONDON, N.14.

GENERAL ASSISTANT ENGINEER (Planning and Development) (158/54.R). Candidates should have had a sound technical training and experience in the planning and construction of large urban and rural distribution systems (including substations) at voltages up to 33 kV.

Salary in accordance with Class N, Grade 13 of the National Joint Board Salary Agreement, commencing at £692 plus London allowance.

Apply to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14.

ST. ALBANS AND WELWYN DISTRICT.

(1) SENIOR SERVICE CENTRE ASSISTANT (157/54.R).
(2) GENERAL ASSISTANT ENGINEER (156/54.R).

Candidates for (1) should be capable of taking charge of a service centre, controlling service centre staff and handling consumers' enquiries efficiently. They should have had extensive sales and consumer service experience and possess a thorough knowledge of appliances, contracting and the application of standard tariffs. The possession of the E.D.A. Salesmanship Diploma or E.A.W. Certificate will be an advantage.

Salary in accordance with Grade 2 (£485 × £20 to £545) of the National Joint Council Salary Agreement.

Candidates for (2) should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems, including substations.

Salary in accordance with Class F, Grade 11 of the National Joint Board Salary Agreement, commencing at £548.

Apply for both positions to the District Manager, Eastern Electricity Board, 107, St. Peter's Street, St. Albans, Herts.

Future salaries and conditions of service for all these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. 5791

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER, ROSSENDALE DISTRICT. Duties will include control and supervision of industrial and domestic contract wiring, preparation of specifications and installation, repair and maintenance of appliances on consumers' premises. Preference given to applicants who are Associate Members of the Institution of Electrical Engineers.

Salary scale £649/£681 p.a., Grade E.7. N.J.B. conditions.

Applications to Sub-Area Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee Street, Blackburn, by 6th November, 1954.

Note: Applicants who responded to the previous advertisement of this post need not re-apply. 5750

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

THIRD ASSISTANT ENGINEER (CONSTRUCTION, TRANSMISSION DEPARTMENT, DIVISIONAL HEADQUARTERS. (Vacancy No. 159/54/ER).

Applicants must have had experience in the construction of E.H.T. lines in the field from initial profile to final sag checking. Experience of pre-cast concrete structures and mass foundations will be an advantage.

Preference will be given to applicants who hold qualifications leading to Corporate Membership of Institution of Civil or Electrical Engineers, or equivalent qualifications

The salary for this appointment will be within Schedule C, Class AX/DX, Grade 5 (£649-£858 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications. 8th November, 1954.

SHIFT CONTROL ENGINEER, LONGFORD POWER STATION, COVENTRY. (Vacancy No. 161/54/ER).

Applicants should have had a sound training and practical experience in a modern generating station. The possession of technical qualifications is desirable.

Salary will be in accordance with Class C, Grade 10 (£608-£630 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 15th November, 1954.

JUNIOR ENGINEERS, FREEMAN'S MEADOW POWER STATION, LEICESTER. (Vacancy No. 162/54/ER).

Some experience in control room and boiler house work in a large P.F. station is required. Technical qualifications up to H.N.C.

Salary in accordance with Class H, Grade 15 (£448 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 15th November, 1954.

FIRST ASSISTANT STATION CHEMIST, DRAKELOW GENERATING STATION. (Vacancy No. 163/54/ER).

Applicants should be Associates of the Royal Institute of Chemistry or hold the Higher National Certificate in Chemistry.

Experience in power station practice essential.

Salary in accordance with Class J, Grade 9 (£719-£750 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 15th November, 1954.

ASSISTANT MAINTENANCE ENGINEER (MECHANICAL), DRAKELOW POWER STATION. (Vacancy No. 164/54/ER).

Previous operation and maintenance experience with modern high pressure plant, with technical qualifications up to H.N.C. standard essential.

Salary in accordance with Class J, Grade 9 (£719-£750 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 15th November, 1954.

ASSISTANT MAINTENANCE ENGINEER (ELECTRICAL), DRAKELOW POWER STATION. (Vacancy No. 165/54/ER).

Previous operation and maintenance experience with all types of electrical plant in a modern power station, with technical qualifications up to H.N.C. standard as a minimum requirement.

Salary in accordance with Class J, Grade 9 (£719-£750 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 15th November, 1954.

TWO SENIOR DRAUGHTSMEN (CIVIL), CONSTRUCTION DEPARTMENT. (Vacancy No. 167/54/ER).

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:—

Reinforced concrete structures.

Piled and slab foundations for heavy components.

Cable subways, bridges and culverts.

Salary in accordance with Grade 5 (£567-£671 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications 15th November, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form, A.E.6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

22nd October, 1954. 5793

ENGINEER

AN ENGINEER is required in South London who is interested in a position which offers considerable scope for the application of fundamental design knowledge to special machines, control gear, etc.

Should be aged about forty; have a university degree; be a Corporate Member of the I.E.E.; and have had experience of electrical and mechanical design of small machines.

The right man will receive full and sympathetic support from the management, and time will be allowed for the assimilation of the duties involved in taking over the control of a design department.

This is an exceptional opportunity, and the appointment will carry an appropriate salary from the date of commencement.

Write, giving full details of education, training and career, to—

Chief Engineer,
Box 2V.K5817, A.K. Advg., 212a, Shaftesbury Avenue, London, W.C.2.

5561

SOUTHERN ELECTRICITY BOARD

Draughtsman (Civil Engineering)

NO. 2 (Newbury) Sub-Area Office. Salary, N.J.B., Schedule D, Grade 6 £433-£567 per annum). N.J.B. conditions of service.

Applicants should be capable of preparing drawings and making calculations, and have knowledge of building construction, steel-work and reinforced structures.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him in envelopes suitably endorsed not later than 12th November, 1954.

Wayleave Officer

Newbury District of No. 2 (Newbury) Sub-Area. Salary, N.J.C., Grade 2 (£485-£545 per annum). N.J.C. conditions of service.

Applicants should have the ability to negotiate wayleave agreements for the erection or laying of electric lines and installation of substation plant.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him in envelopes suitably endorsed not later than 12th November, 1954.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards Superannuation Scheme, if eligible. 5794

CITY COUNCIL OF SINGAPORE

Electricity Department

APPLICATIONS are invited for the post of BOILER HOUSE SHIFT ENGINEER in the City Electricity Department, appointment in the first instance being on 3 years' agreement. On satisfactory completion of the agreement the appointee would normally be offered emplacement on the permanent establishment.

Applicants must possess 1st Class Board of Trade Steam Certificate or Graduate Membership of the Institution of Mechanical Engineers or Higher National Certificate (Mechanical) or equivalent, and must have experience in the operation of large modern high-pressure oil/coal-fired boiler plant. Minimum age 24.

The salary offered is $660, $690 and $720 a month for the 1st, 2nd and 3rd year respectively. Expatriation and cost-of-living allowances at such rates as may be approved by the Council from time to time are payable. The existing rates are as follows:—

Expatriation allowance £287 per annum on basic salaries up to $720 a month.

Present rate of cost-of-living allowance payable on basic salary between $660 and $720 a month is £238 per annum for a single man; £345 16s. to £362 12s. per annum for a married man; £466 4s. to £495 12s. per annum for a married man with one or more dependent children. (A dependent child means an unmarried child, including a step-child or a legally adopted child, under the age of 17, or receiving full-time educational instruction and below the age of 21.)

For a single man the minimum total emoluments on a basic salary of $660 a month would amount to £1,449 per annum; for a married man with no children £1,556 16s. per annum, and for a married man with one or more children £1,677 4s. per annum.

The exchange rate is approximately $1 to 2s. 4d. sterling.

Partly furnished quarters provided if available at 6% of basic salary, or housing allowance of 10% of basic salary (subject to a maximum of $120 p.m.) paid in lieu.

Free passages will be provided for appointee, his wife and his own children under the age of 12 years at the date of sailing, subject to a maximum of three full passages.

Leave: One month per year of service may be granted on satisfactory completion of agreement at the discretion of the Council. If placed on the permanent establishment on completion of the agreement the appointee will be required to serve a further year before proceeding on leave. The present rate of leave is 4 days per month of resident service. Local leave of 14 days a year cumulative to a maximum of 28 days may also be granted.

Compulsory provident fund contributions at present 7½% of salary (but not allowances), to which the Council donate 7½% rising to 10% after 10 years' service, 15% after 15 years' service and 20% after 20 years' service. This scheme is under review.

Applications in duplicate, giving full information regarding all experience, qualifications and personal circumstances, with copies of 3 recent testimonials, also in duplicate, to Messrs. Allen & Williams, 1, Victoria Street, London, S.W.1, before Tuesday, 16th November, 1954. 5738

ADMIRALTY—
ROYAL NAVAL SCIENTIFIC SERVICE

SENIOR SCIENTIFIC OFFICERS and SCIENTIFIC OFFICERS required in Experimental Establishments in London, Portsmouth, Weymouth and Gloucestershire areas and Scotland. The majority of the posts are for Engineers and Physicists (particularly with Electronics).

Candidates must be British subjects with an appropriate first or second class honours degree or equivalent high professional attainments.

Salaries: S.S.O. (M) £975-£1,150; S.O. (M) £470-£855. London rates. Somewhat lower in Provinces. All appointments are unestablished (with F.S.S.U.), but with some opportunities to compete for established posts.

Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A.246/52/A. 207

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS; PATENT EXAMINER AND PATENT OFFICER CLASSES

THE CIVIL SERVICE COMMISSIONERS invite applications for pensionable appointments. Applications will be accepted up to 31st December, 1954. Interview boards will sit at frequent intervals. The Scientific posts cover a wide range of scientific research and development in most of the major fields of fundamental and applied science. In biological subjects the number of vacancies is small; individual vacancies exist at present for candidates who have specialised in palæobotany, foraminifera, malacology and lichenology. The Patent posts are in the Patent Office (Board of Trade) and Ministry of Supply.

Candidates must have obtained a university degree with first or second class honours in an appropriate scientific subject (including engineering) or in mathematics, or an equivalent qualification; or, for Scientific posts, possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' postgraduate or other approved experience. Candidates for Scientific Officer and Patent posts who took their degree examination in 1954 may apply before the result is known.

Age limits: Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted. For Scientific Officers and Patent Classes, between 21 and 28 during 1954 (up to 31 for permanent members of the Experimental Officer class).

Salary (London): Senior Scientific Officers (men) £975-£1,150, (women) £845-£1,025; Scientific Officers (men) £470-£855, (women) £470-£750; Patent Examiner and Patent Officer Classes (men) £440-£760 (rates under review). Women's rates somewhat lower. Somewhat lower rates in the Provinces.

Further particulars from the Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1, quoting No. S/53/54 for Senior Scientific Officers and S.52/54 or S.128/54 for the other posts. 5737

MAURITIUS CENTRAL ELECTRICITY BOARD

THE Board is shortly embarking on an all-island scheme of electrification involving the construction of thermal and hydro power stations together with some 400 miles of overhead lines, and applications are invited for the following two senior appointments:—

(a) GENERATION AND DISTRIBUTION ENGINEER (M2A/40494/EF). Salary scale equivalent to £1,500 rising to £1,875 a year. The post will carry responsibility for all engineering matters, including the operation of power stations and the design, layout, survey, construction and operation of H.V. and L.V. lines and substations. Candidates should be between 35 & 45 years of age and must be fully qualified electrical engineers with administrative ability and previous experience in a public electricity supply undertaking. Experience of the maintenance and operation of either diesel or hydro electric generating plant is desirable.

(b) COMMERCIAL OFFICER (M2A/40495/EF). Salary scale equivalent to £1,350 rising to £1,650 a year. The post will carry responsibility for all commercial matters relating to the supply of electricity to consumers, including correspondence, quotations, negotiations for special arrangements, etc. Applicants should be between 30 and 45 years of age, must have had extensive commercial experience in a public electricity supply undertaking and be capable of building up an active sales organisation. They should also be familiar with the framing and application of tariffs and the keeping of consumers' records and statistics.

The appointments will be for one tour of 3 years in the first instance with prospect of permanency. Superannuation scheme. Local leave two weeks each year, with overseas leave of 6 months at the end of the tour. Free first-class passages for the officer, his wife and two children. Assistance will be given towards cost of housing.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, quoting the reference of appointment applied for. 5804

BRITISH ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES:—

(a) STATION SHIFT CONTROL ENGINEER, Newton Abbot Generating Station. N.J.B. F.10, £577-£598.

(b) STATION SHIFT CONTROL ENGINEER, Plymouth B Generating Station. N.J.B. G.10, £608-£630.

(c) ASSISTANT SHIFT CHARGE ENGINEER, Plymouth A Generating Station. N.J.B. F.9, £607-£629.

(d) ASSISTANT MAINTENANCE ENGINEER (Mechanical), Plymouth A Generating Station. N.J.B. F.8, £635-£664.

(e) JUNIOR ENGINEER (Control), Hayle Generating Station, N.J.B. Clause 35, Class F within Grades 15-14, £402-£466.

Superannuation scheme.

Applicants for (a) and (b) should possess good technical qualifications, and have had training and experience in the control and operation of steam generating plant and main switchgear.

For (c) applicants should have had a sound technical training and practical operating experience in a modern generating station.

For (d) applicants must have had a thorough practical mechanical engineering training and considerable experience in the maintenance of turbines, boilers and auxiliary plant. Corporate membership of the Institution of Mechanical Engineers or equivalent an advantage.

For (e) applicants should possess O.N.C. in Electrical or Mechanical Engineering or equivalent. Previous generating station experience an advantage.

Please state clearly for which appointment you wish to be considered.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 8th November, 1954. 5774

THE MULLARD RADIO VALVE CO. LTD.

require a PHYSICIST or ELECTRICAL ENGINEER for its Cathode Ray Tube Department.

The successful candidate will be expected to carry out investigations and experiments in production techniques, materials and manufacturing equipment. The main emphasis will be upon manufacturing rather than development work.

Applications are invited from Physicists or Engineers possessing a B.Sc. degree or equivalent qualifications, and previous experience is not essential.

The vacancy outlined above is caused by the expansion of the company's activities in this field. Commencing salary will be according to individual age, experience and qualifications, and can be considered as progressive.

The company's policy regarding the employment of scientific staff provides adequate prospects of advancement and breadth of outlook is assured by opportunities for transfer to other fields of work within the company.

There are facilities for further study and a company pension scheme and progressive holiday plan.

Applications in writing will be treated with the strictest confidence and should be addressed to the Personnel Officer, The Mullard Radio Valve Co. Ltd., New Road, Mitcham Junction, Surrey, quoting reference JFG/A.1/M.P.4.

5780

DRAUGHTSMEN

SENIOR DEVELOPMENT DRAUGHTSMEN required with previous experience of E.H.T. and L.T. switchgear or motor control gear. Pension scheme in operation. Excellent conditions.

Apply by letter, giving particulars previous experience, age and salary required, to Erskine, Heap & Co. Ltd., Lancashire Switchgear Works, Manchester, 7. 5621

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

CASTLEFORD DISTRICT.

SECOND ASSISTANT DISTRICT ENGINEER. Applicants must be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They must have had a sound practical training and extensive experience in the design, construction, operation and maintenance of H.V. and M.V. overhead and underground distribution systems, substation plant and ancillary equipment, preferably in a large undertaking.

Salary N.J.B. Class F, Grade 7, £697/£718 per annum.

CASTLEFORD DISTRICT.

CONSUMERS' ENGINEER. Applicants, who must have had a sound practical training and considerable experience in the work of a consumers' engineer, will be required to give advice to all classes of consumer concerning the utilisation of electricity.

Experience is required in negotiations for supply; the interpretation and application of the I.E.E. Wiring Regulations and other regulations concerned with the testing and inspection of consumers' installations; tariffs; sales development; the control of staff and manual workers.

Salary N.J.B. Class F, Grade 8, £635/£664 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 11th November, 1954. 5773

BROOKHIRST SWITCHGEAR LIMITED

have vacancies in London for

1. APPLICATION ENGINEERS. Duties include handling of contracts involving technical correspondence, and personal contact with customers, preparation of schemes, manufacturing specifications and installation and operation instructions. Applicants should have had works and drawing office experience and be in possession of H.N.C. or the equivalent.

2. JUNIOR DRAUGHTSMEN, to be responsible to the above Application Engineers. An O.N.C. in either Mechanical or Electrical Engineering is desirable but not essential.

For the senior appointment previous experience on comparable work is desirable, but training would be given where necessary.

These posts are permanent and pensionable and the commencing salary will be commensurate with age and experience.

Please reply giving details to the Manager, Power Applications Branch, Brookhirst Switchgear Limited, Universal House, 60, Buckingham Palace Road, London, S.W.1.

5754

DUDLEY AND STAFFORDSHIRE TECHNICAL COLLEGE

APPLICATIONS are invited for the post of ASSISTANT LECTURER in Electrical Engineering. Applicants must have had adequate industrial experience, and must be professionally qualified. Duties will begin on 1st January, 1955. Salary on Grade A of the Burnham Technical Report (£450 × £18 to £725) with allowances, where appropriate, for graduate qualifications, training and experience.

Application forms and further particulars may be obtained from the Principal, Dudley and Staffordshire Technical College, Dudley, to whom the completed forms must be returned as soon as possible.

A. W. GIBSON,
Principal.

5799

HER MAJESTY'S COLONIAL SERVICE

Broadcasting Engineers

APPLICATIONS are invited from radio engineers for eventual appointment as BROADCASTING ENGINEERS in the Government broadcasting services of Colonial and Oversea Territories.

Applicants should be over the age of 28 and be Graduates of the Institution of Electrical Engineers or in possession of an engineering degree or diploma recognised as granting exemption from Sections A and B of the Institution's examination. Experience in the radio industry or in the radio branches of Her Majesty's Services for at least two years is necessary, but applicants need not have experience directly related to broadcasting.

Successful applicants will receive operational training in the B.B.C., and at any time within two years after initial engagement they will be required to take up contract appointments with a Colonial or Oversea Government in any part of the world as broadcasting engineers. Choice of territory will be given where possible, but is not guaranteed.

Total emoluments during training in the U.K. £800 per annum. Salary on appointment to a Colonial territory will not be less than £1,000 per annum plus such allowances as are prescribed under the regulations of the territory concerned.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD.96/02/D11. 5719

SHIFT CHARGE ENGINEER

required for service with the SUDAN LIGHT & POWER Co. Ltd., in Khartoum, Anglo-Egyptian Sudan. Basic salary in the range of £E.900/£E.1,380 per annum. Candidates must have good general education and sound technical training with ability to control and instruct staff; and extensive experience in the operation of diesel generating sets up to 1,200 kW and E.H.T. switchgear and associated control equipment. Steam generating plant will be added in the near future and an extra qualification would be knowledge of and experience in the operation of steam turbo-alternator plant and oil fired boilers up to 400 lbs. per sq. in. In addition to basic salary a cost of living allowance will be payable, and a kit allowance of £E.50 on appointment.

Appointment will be on contract up to 5 years, including a period of 12 months probation, with a bonus payable on completion of the contractual period.

Free living accommodation with basic furniture or an allowance in lieu therof. After satisfactory completion of the probationary period liberal leave on full salary with free passages.

Applications stating age, education, qualifications, experience (with particulars of posts held), present appointment and salary with names of two references should be submitted to the Secretary, The Power & Traction Finance Co. Limited, Queens House, Kingsway, London, E.C.2. 5800

WOLVERHAMPTON & STAFFORDSHIRE TECHNICAL COLLEGE

Principal: C. L. Old, B.Sc.(Eng.), M.Sc.Tech.

APPLICATIONS invited for post of ASSISTANT LECTURER Grade A in Electrical Engineering.

Applicants must have industrial experience and possess an engineering degree, Higher National Certificate in Electrical Engineering, or Graduate Membership of the Institution of Electrical Engineers.

Salary in accordance with Burnham Technical Report, £450 to £725 per annum, with allowances for degree, training, etc.

Further particulars and form of application may be obtained from the undersigned by sending stamped addressed foolscap envelope. Completed applications to be returned as soon as possible.

G. W. R. LINES,
Clerk to the Joint
Education Committee.

Education Offices,
North Street,
Wolverhampton.
19th October, 1954. 5751

STATION ENGINEERS

required by AIR MINISTRY at R.A.F. and M.C.A. stations. Qualifications and experience required: (a) Ordinary National Certificate in Electrical Engineering or equivalent standard of technical education; (b) Recognised apprenticeship in electrical engineering; (c) Three years' responsible engineering employment preferably on operation and maintenance of mine, factory or workshop plant and services. Supervisory experience an advantage as duties entirely supervisory and cover installation, operation and maintenance of high and medium-voltage distribution systems, internal electrical installations, and other miscellaneous installations, tools and equipment.

Commencing salary according to age, qualifications and experience (normally £550 at age 28 or over) on range £510 to £640. Appointments include liability for service overseas, for which special allowance payable in addition to higher salary. Appointments non-pensionable. Only natural-born British subjects.

Write, giving date of birth, education, full details of qualifications and experience of posts held (including dates) to E.A.1564, Appointments Officer, Ministry of Labour and National Service, 1-6, Tavistock Square, London, W.C.1.

No original testimonials should be sent. Only candidates selected for interview will be advised. 5772

BRITISH INSULATED CALLENDER'S CABLES LTD.

invite applications for the following vacancies at their Leigh Works, nr. Manchester.

GRADUATE PHYSICIST or ELECTRICAL ENGINEER for the Electro-Physical Laboratory. The work involves the study of electrical properties of rubber and synthetic insulating materials under a wide range of physical conditions. Investigational work relates to the performance of experimental cables embodying new and improved designs. Candidates should have an interest in the practical use of all types of electrical measuring equipment, but previous industrial experience is not necessary. Ref. A/26/54.

GRADUATE PHYSICISTS for Development Laboratory and Pilot Plant. The positions provide splendid opportunities for recently qualified men who need not have had previous industrial experience. The investigational work involves modifications to existing processes as well as the development of new and improved techniques and designs. A flair for designing and constructing pieces of special equipment with which to conduct experiments would be an advantage but is not essential. Ref. A/3/54.

Applications in writing, quoting the appropriate reference, should be addressed to—The Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. 5752

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD., LIVERPOOL, 7

Communication Engineers and Draughtsmen

THE expanding programme of the Transmission Department offers vacancies in both senior and junior categories for LINE TRANSMISSION LABORATORY ENGINEERS and APPARATUS DESIGN ENGINEERS, and also for DRAUGHTSMEN with experience in telecommunications or light current engineering.

Specialist experience in any branch of line transmission engineering is desirable for some of the posts.

Positions offered are on the company staff with contributory pension fund and usual staff conditions.

Applicants should write to Personnel Manager, Automatic Telephone & Electric Co. Ltd., Strowger Works, Edge Lane, Liverpool, 7, giving full details of age, qualifications and experience. 209

ELECTRICAL AND RADIO DRAUGHTSMEN REQUIRED

APPLY to Employment Manager, Vickers-Armstrongs Limited (Aircraft Division), Hurn Airport, Nr. Christchurch, Hants. 5599

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

ASSISTANT ENGINEER (Instruments), Kingston B Power Station. Applicants should preferably possess Higher National Certificate and must be experienced in the maintenance, testing and calibration of all types of power station instruments. A knowledge of electronics would be an advantage. Class G, Grade 9, £673 1s. per annum.

SHIFT CHARGE ENGINEER, Croydon B Power Station. Applicants should have had suitable technical training, together with extensive experience in the operation of modern high-pressure, turbine and boiler plant, E.H.T. switchgear and in the control of labour. P.F. experience an advantage. Class J, Grade 7, £857 17s. per annum.

N.J.B. conditions of service for both positions. Salaries quoted include London allowance.

Applications, giving details of education, present position, experience, etc., should be received by the Station Superintendent at either Kingston B Power Station, Downhall Road, Kingston, Surrey, or Croydon B Power Station, Beddington Farm Road, Croydon, Surrey, according to the location of the vacancy, by 6th November, 1954. 5790

ASSISTANT TECHNICAL OFFICERS

IMPERIAL CHEMICAL INDUSTRIES LIMITED, WILTON WORKS, near Redcar, has further openings for Assistant Technical Officers in the following sections of the Drawing Office:—

MECHANICAL
ELECTRICAL
INSTRUMENT

for design of large power station extensions and other projects.

Applicants should possess the appropriate National Certificate. Appointments are to the permanent staff, 5-day/39-hour week, with first-class working conditions, including pension fund and recreation facilities.

Write for application form to the Staff Officer, Imperial Chemical Industries Ltd., Wilton Works, Middlesbrough, Yorkshire, or apply to the nearest Employment Exchange, quoting advertisement reference ICI/X/199/k.

5736

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 102/54

APPLICATIONS invited for superannuable N.J.B. appointment of GENERAL ASSISTANT ENGINEER, Technical Department, Divisional Headquarters. Salary AX/CX.8, £501-£675 per annum.

Candidates should possess a degree or H.N.C. in Electrical Engineering; some experience in the manufacture, design or erection of high-voltage transmission equipment desirable. Required to assist in the design of a 132-kV transmission system and in the investigation of a wide range of system problems, including fault calculations and load flow studies.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Road, Gabalfa, Cardiff, to be returned by 8th November, 1954. 5777

CONTACTOR SWITCHGEAR LTD.

ENGINEERS required for both Engineering and Estimating Departments for control gear applications up to 1,000 h.p. low and high tension.

The Company operates a contributory pension scheme and will share cost of removal in approved cases.

Applicants should have completed their National Service and be preferably not over 45.

Write, in confidence, stating age, experience, and salary required, to the Secretary, Blakenhall, Wolverhampton. 5797

INSTALLATION SUPERINTENDENT

required by SIERRA LEONE GOVERNMENT ELECTRICITY DEPT. for 2 tours each of 18 to 24 months either (1) with prospect of pensionable employment at salary, etc., according to experience in scale £742 rising to £1,177 a year, or (2) on temporary terms at salary, etc., according to experience in scale £789 rising to £1,272 a year with gratuity up to £150 a year. Outfit allowance £60. Free passages for officer, wife and two children up to age 10, or grant up to £150 a year for children's maintenance in U.K. Liberal leave on full salary.

Candidates must have served an apprenticeship in the maintenance section of a large works or in the consumers' section of an electricity undertaking and should hold an O.N.C. or appropriate C. & G. Certificates. They must have experience in the maintenance of motors and associated control gear up to 100 h.p., the installation of power and lighting circuits to comply with I.E.E. regs., and the testing of single-phase meters.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/28555/EF. 5802

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following post:—

JUNIOR ENGINEER,
NORWICH GENERATING STATION.

Salary Class F/15, £402, Class F/14, £466 per annum.

The duties of the successful applicant will include assisting in the control room on shift and other operation and investigation duties. Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications stating age, qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, London, N.14, by 6th November, 1954.

W. N. C. CLINCH,
Controller. 5776

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside & N. Wales Division

APPLICATIONS are invited for the appointment of SECOND ASSISTANT STATION CHEMIST at the Bromborough Power Station, Cheshire. Salary £607/£628 per annum, N.J.B. Class H, Grade 11. Superannuable and subject to medical examination.

Applicants should preferably hold a University Degree or A.R.I.C., but consideration will be given to those holding the Higher National Certificate and studying for A.R.I.C. or an equivalent qualification. A thorough knowledge of the chemical services required in a modern power station is essential.

Application forms may be obtained from the Divisional Controller, Beaconsfield Road, Woolton, Liverpool. Closing date: 8th November, 1954. 5798

THORN ELECTRICAL INDUSTRIES LTD.

invite applications for the position of CHIEF ENGINEER in their Tricity Division.

The appointment, based on London, carries responsibility for the design and development of electric cookers and other domestic equipment, and wide experience in this field is essential.

Applications, giving full details of qualifications and career, should be addressed to:—

The Technical Director
THORN ELECTRICAL INDUSTRIES LTD.
105, Judd Street, London, W.C.1
5720

CABLE INDUSTRY

AN executive appointment with well-known Plastic Cable manufacturers in the North-West is offered to a well-educated young man with general technical experience in the industry and proved selling ability and control of sales staff. Applicants must possess qualifications fully justifying a directorship.—Box 5721.

TECHNICAL INSTRUCTOR (ELECTRICAL)

required for NIGERIA for two tours of 15-24 months or three tours of 10-12 months with option of appointment either (a) on agreement with prospect of permanent and pensionable employment in salary scale (including expatriation pay) £750 rising to £1,175 a year or (b) on temporary contract in salary scale (including expatriation pay) £807 rising to £1,269 a year with a gratuity at rate of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Liberal leave on full salary.

Candidates, under 40 years of age, must have served an apprenticeship to electrical engineering and be experienced practical tradesmen. They should hold a C. & G. or other recognised technological certificate and have had experience in apprentice training.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/29963/EF. 5803

B.T.H. INVITES APPLICATIONS

from men of initiative to join their sales organisation which is responsible for handling all B.T.H. electrical and mechanical plant, both heavy and light.

Openings exist in Rugby, London and the Provinces for men with ability seeking advancement: Duties range from co-ordination of engineering and commercial handling of contracts at head office to district representation.

Commercial experience is not essential, but candidates should have received practical training in electrical engineering and possess a degree, Higher National Certificate or equivalent. Appointments include membership of pension scheme after qualifying period.

Applications, which will be treated as confidential, should be addressed to the British Thomson-Houston Co. Ltd., Sales Management, Rugby, and should include particulars of age, etc., technical qualifications and previous experience. Interviews will be arranged locally where possible to suit selected candidates. 5611

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS are invited for the post of CHIEF COMMERCIAL ENGINEER.

In addition to experience in the electricity industry—not necessarily limited to the field of supply—the special character of the Board's functions make it desirable that the applicant should have extensive knowledge of general commercial development.

Salary within the range £2,500/£3,200.

Applications to the General Manager of the North of Scotland Hydro-Electric Board, 16, Rothesay Terrace, Edinburgh, by 15th November, 1954. 5792

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER, Ashford District. Salary £500 p.a. under N.J.B. Class D, Grade 11. Superannuable.

Applicants should have technical training and practical experience in the construction, operation and maintenance of underground and overhead distribution systems. The position will entail standby duties.

Applications naming 2 referees to D. B. R. Roberts, A.I.E.E., Ashford Manager, SEEBoard, Victoria Road, Ashford, Kent.

A. L. BURNELL,
Secretary.
5801

SOUTH WESTERN ELECTRICITY BOARD

DEMONSTRATOR, EAST DEVON DISTRICT (EXETER). Salary, N.J.C., Grade 1, £400-£490 per annum.

Duties include public demonstrations of cooking and electrical appliances, and advice generally on their use. Candidates should possess recognised domestic science qualification, with preferably E.A.W. Electrical Housecraft Certificate.

Application forms obtainable from the Manager, East Devon District, Pearl Assurance House, High Street, Exeter, should be returned by 12th November, 1954. 5796

MIDLANDS ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER required in the Wednesbury District of the South Staffs and North Worcs Sub-Area. Applicants should have had extensive experience in the industrial and domestic aspects of commercial work, including installations, public lighting and sales and service to the consumer. The duties will include the preparation of technical schemes and estimates and participation in negotiations for the supply of electrical energy.

Technical qualifications desirable. Salary £925/£944 per annum (N.J.B. Class G, Grade 4). Superannuable.

Apply in writing within 7 days, stating age, training, qualifications, experience, present position and salary, to Sub-Area Manager (Ref. CW), Midlands Electricity Board, Toll End Road, Tipton, Staffs.

A. STEPHENS,
Secretary. 5789

SOUTH WESTERN ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER, TAUNTON. Salary, N.J.B., Class E, Grade 4, £803-£834 p.a.

Duties include responsibility to the District Manager for all commercial negotiations with consumers including the technical aspects; supervision of service centres and outside sales staff; control of installation contracting and consumers' service; organisation of exhibitions, demonstrations and publicity; preparation of revenue estimates. Candidates should possess extensive knowledge of, and have had wide experience in, the commercial side of the industry and be capable of promoting a progressive commercial development policy. Corporate membership of the I.E.E. is desirable.

Application forms obtainable from the Manager, Taunton Sub-Area, The Parade, Taunton, should be returned by 12th November, 1954. 5795

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 103/54

APPLICATIONS invited for superannuable N.J.B. appointment of ASSISTANT SHIFT CHARGE ENGINEER at Uskmouth Power Station. Salary K.9, £766-£796 per annum.

H.N.C. and regular apprenticeship desirable. Operating experience in a modern generating station essential.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Road, Gabalfa, Cardiff, to be returned by 8th November, 1954. 5778

SIMPLEX ELECTRIC CO. LTD.

Appointment of Development Engineer, Development Department

APPLICATIONS are invited for the position of SENIOR ENGINEER in the Development Department at Creda Works, Blythe Bridge, near Stoke-on-Trent, for work on Creda cookers and associated products. This is a position of considerable responsibility and carries an appropriate salary.

Applications in writing, giving full details of qualifications and experience, should be addressed to the Secretary, Simplex Electric Co. Ltd., Oldbury, Birmingham. 5494

LAURENCE, SCOTT & ELECTROMOTORS LTD.

Assistant Electrical Designers

VACANCIES exist in the Design Department at our Norwich works for young engineers having engineering degrees or H.N.C. for design and application of variable speed A.C. machines. There is also a vacancy for an Induction Motor Designer. Applicants should have completed or be exempt from National Service.

Write, giving full particulars, to the Secretary, Laurence, Scott & Electromotors Ltd., Gothic Works, Norwich, Norfolk. 5753

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

VACANCY No. 198/54/R: SHIFT CHARGE ENGINEER, Barrow Generating Station. Salary £633/£643 (D.7).

Vacancy No. 202/54/R: STATION SHIFT CONTROL ENGINEER, Nelson Generating Station. Salary £531/£547 (D.10).

Closing date 6th November.

Vacancy No. 205/54/R: STATION CHEMIST, Carlisle Generating Station. Salary £697/£718 (F.7). Closing date 20th Nov.

Applications, quoting vacancy number, to Controller, British Electricity House, 825, Wilmslow Road, Manchester, 20. 5775

CHIEF ENGINEER

required to commence duty as early as possible and to control Drawing Office, Development and Design. Must have technical and practical experience of switchgear up to 11 kV and preferably some knowledge of motor control gear. He must be a Member or Associate Member of the Institution of Electrical Engineers. Good permanent and progressive position with high salary for the right man. Pension scheme in operation. Apply by letter, marked personal, giving full particulars of experience, salary required, to Managing Director, Erskine, Heap & Co. Ltd., Lancashire Switchgear Works, Manchester, 7.

5739

A LARGE and expanding firm of manufacturers in North Staffs require an electrical draughtsman for plant layout and lighting schemes. Applicants should be 25 to 35 years of age with practical experience in wiring layouts or control gear circuit work. Assistance with housing will be given to married men if necessary. Salary according to age, experience and ability. Write in confidence giving all relevant details to Personnel Manager, Michelin Tyre Co. Ltd., Stoke-on-Trent, Staffs. 5512

A LEADING cable manufacturer wishes to appoint manager to its branch in Manchester. Applicants should have wide background in the cable industry and preferably be Corporate Members of the Institution of Electrical Engineers.—Box 5781.

A MAJOR British oil company requires for its overseas service an electrical engineer who would be responsible to chief electrical engineer for installation of generating and distributing plant, switchgear, motors, etc., and operation/maintenance thereof. Applicants must have served a recognised apprenticeship and hold H.N.C. or equal. Single men not over 28 preferred. Attractive salary, currently augmanted by cost-of-living allowance; kit allowance; medical attention; pension fund; free furnished quarters and passages. Write, stating age, qualifications and full details of training and experience, to—Box E.R.459, c/o 191, Gresham House, London, E.C.2. 5805

A MALE clerk for electr. contractors and tool merch. to assist in retail shop, office and stores. Knowl. electr. goods, tools, office work desirable. Good typing and figure work essential. Unique opport. of all-round business career f. educated amb. man. Active older applicants invited. Write—Electrobuild, 159, Notting Hill Gate, London, W.11. 7701

APPLICATIONS are invited for radio and television salesman-mechanic. Applicants must be able to service and maintain all types of radio and T.V. sets, and must possess qualifications of the recognised trade bodies. No house available. Applications, in writing, stating age, experience, wages required (no overtime paid), with copies of recent testimonials, to be sent to General Manager, Musselburgh & Fisherrow Co-operative Society Ltd., Musselburgh, not later than Monday, 25th October, 1954. 5622

ASSISTANT power production superintendent wanted for Canadian-owned 75,000-kW public utility in Maracaibo, Venezuela. Age 30-40, preferably married. Previous experience turbines and oil-fired boilers essential. Permanent engagement, good salary, ample period and local leave. Applications with brief qualifications in writing only to Messrs. Mackness & Shipley, Parliament Mansions, Abbey Orchard Street, London, S.W.1, who will provide full particulars. 5656

ARMATURE winder required capable of tackling independently A.C./D.C. work, chiefly high-tension side, for Calcutta (India) electric-breakdown-repairs company. Salary £80 per month with up and down free passage and paid holiday after 3 years. Good prospects for young bachelor. Apply with testimonials of experience and names of companies previously worked for to—Evans Electric Limited, 485, Cadell Road, Bombay, 28, India. 5740

ARMATURE winder required, excellent conditions and rates, 20 mins. from Waterloo. —Max Arc & Electrics Ltd., Terrace Road, Walton-on-Thames, Surrey. 170

ASSISTANT engineer experienced in cable laying, overhead transmission lines, and if possible general installation work, for contractors' Midlands office. Possibility of transfer abroad later. Write details age, experience.—Box 5408.

ASSISTANT export manager required for the development of electric lamps and lighting fittings market. Excellent prospects, pension scheme. Full details in confidence to —The General Manager, Ekco-Ensign Electric Ltd., 45, Essex Street, London, W.C.2. 7692

ASSISTANT plant efficiency engineer (steam turbine and auxiliaries) required in Manchester by consulting engineers to handle testing and investigational work relating to large power station turbo-alternator plants. Applicants should preferably possess an engineering degree, and previous testing experience and familiarity with the thermal calculations involved in preparing reports on the overall and detailed site testing of turbo-alternators and allied plant is desirable. Please apply, including schedule of experience, to—Staff Applications, Kennedy & Donkin, 813a, Wilmslow Road, Manchester, 20. 5722

ASSISTANT required for electrical contractors' office, London, W.C. district. State age and experience.—Box 5724.

ASSISTANT required to manager of branch electrical installation business, large South Coast town. Apply with statement of experience and testimonials to—Box 5756.

ASSISTANT to buyer, male, age about 30, required for engineering firm at their Wembley factory. Electrical engineering experience and familiarity with modern stores control systems advisable. Post offers scope for advancement. Salary according to qualifications and experience. Profit-sharing and contributory pensions schemes. Write stating full details and salary required to—Box 5723.

BRUSH BAGNALL TRACTION Ltd., Loughborough, Leics., have vacancies for an experienced design engineer and a draughtsman in the rotating machine department for work in connection with diesel electric locomotives. Applicants for the post of designer should preferably possess an honours degree or be Graduate Members of the Institution of Electrical Engineers. Candidates for the post of draughtsman should preferably hold a Higher National Certificate in Electrical or Mechanical Engineering. These positions call for men able to work with limited supervision, and carry attractive salaries plus non-contributory superannuation, sick pay and other benefits. Please apply with full details to the Chief Personnel Officer. 5755

CEYLON European-controlled company seeks electrical engineer with minimum qualifications National Higher Certificate, preferably unmarried, sound practical knowledge of A.C. and D.C. distribution, alternator and generator installation and maintenance. Estimating and sales experience an advantage. Salary approximately £90 per month, provident fund, medical and other benefits. Write—Box ZS.491, Deacon's Advertising, 36, Leadenhall Street, London, E.C.3. 5700

CHIEF draughtsman required by well-established company in North London area. Must have experience in design of distribution transformers up to 500 kVA. Excellent conditions; group assurance scheme. Write stating age, experience and salary required to—Box 5757.

COOKE & FERGUSON Limited, switchgear specialists, require designs engineers for work on the development of large outdoor high-voltage oil circuit breakers. This work is of a senior and permanent nature. Experience in the development of this type of equipment is essential. Reply stating age, experience and qualifications to—Personnel Officer, South St., Openshaw, Manchester, 11. 5623

CHIEF draughtsman required by electrical engineering firm in Glasgow area due to expansion of drawing office. Previous experience of f.h.p. induction motors and light electro-mechanical relays desirable. Conditions include 5-day week and pension and life assurance scheme. Assistance will be given for suitable applicants requiring housing accommodation. Applications in strictest confidence. Apply giving details of age, experience, qualifications and salary to—Box 5697.

DEMONSTRATOR, experienced, required by Tricity Cookers Ltd. Applicants must be willing to travel anywhere in the British Isles. Write, giving age and full details of education and experience, to—109, Kingsway, London, W.C.2. 5526

DESIGN draughtsman. A vacancy exists in our design drawing office for a first-class designer draughtsman for interesting work associated with the development of automobile electrical equipment. He should be at least of H.N.C. standard and experience in the design of light electrical equipment for large quantity production would be an advantage. The post provides excellent scope for initiative and advancement. Reply, stating qualifications, experience and age, to—Personnel Manager, Joseph Lucas Ltd., Great King Street, Birmingham, quoting reference PM/D/93. 143

DESIGN draughtsman. An excellent opportunity occurs with housing assistance available for a first-class designer-draughtsman with experience of light/medium electro-mechanical equipment for development work on battery electric trucks of advanced design. A substantial salary is offered to a man of proved ability. Applicants should be of H.N.C. standard, must have an original outlook, and be capable of taking charge of a job from its conception to the production stage. Modern factory in country district, 1 hour London. Reply in confidence giving all details to—Box 5726.

DESIGN draughtsman required for work on light electrical mechanisms or instruments. H.N.C. preferred. Pension scheme, canteen. Write in tabulated form to—Personnel Manager, Dowty Equipment Ltd., Arle Court, Cheltenham. 5692

DESIGN engineer required by consulting engineers for preparation of electric light and power schemes and specifications for all types of buildings. Previous experience essential. Write, stating age, experience and salary required, to—E. Wingfield-Bowles & Partners, 32, Old Queen Street, Westminster, London, S.W.1. 156

DESIGN engineers of degree standard with works training are required by rapidly expanding instrument company. Applicants must have had experience in the design of electro-mechanical devices, etc. The position offers excellent prospects to young men who are seeking a permanent position with an expanding team engaged on interesting new instrument problems. Houses are available for successful applicants.—Box 5758.

DESIGNER-draughtsman required with experience of light electrical engineering. Apply giving age, experience and salary required to—Box 7679.

DEVELOPMENT engineers required for important projects in connection with the materials and development testing of prototypes in the expanding Switchgear Division of Brush Electrical Engineering Co. Ltd. Candidates should preferably be chartered electrical or mechanical engineers and must have experience of development or research, preferably in switchgear. Men of resource are required, able to work on their own initiative, and there are good prospects. Conditions of service include staff bonus and non-contributory superannuation scheme. Applications to—The Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics. 5685

DRAKE & GORHAM (CONTRACTORS) Ltd. have a vacancy for an electrical fitter. Must be conversant with installation and maintenance of small diesel generating plants, water pumps and electrical machinery. Permanent position for suitable applicant. Write—2, Wilson's Chambers, Commercial St., Hereford. 5806

DRAUGHTSMAN required by consulting engineers for the reproduction of electric light and power schemes. Previous experience essential. Write, stating age, experience and salary required, to—E. Wingfield-Bowles and Partners, 32, Old Queen Street, Westminster, London, S.W.1. 157

DRAUGHTSMAN with experience of electro-mechanical instrumentation required immediately for interesting work in connection with Government and commercial requirements in new and pleasant drawing office. National Certificate an advantage but not essential. Excellent conditions; 5-day week. Apply to—General Manager, Hendrey Relays Ltd., 392 Bath Rd., Slough, Bucks. 5759

DRAUGHTSMEN required by South Wales Switchgear Ltd. at their Blackwood works for high-voltage switchgear contract works and diagram sections. Applications giving full particulars of experience, qualifications and salary required to—Personnel Manager. 5703

DRAUGHTSMEN with sound experience in the design of high-voltage isolating switches and fuses, 11,000 v. and above. Very good prospects for fully trained draughtsmen. Write giving particulars of experience, age and salary required to—Box 5702.

DRAUGHTSMEN required for automatic electric control gear; 5-day week; excellent working conditions; canteen facilities; convenient transport; incentive bonus; superannuation scheme. Salary according to qualifications, ability and experience. Apply—Asst. Secretary, Watford Electric & Mfg. Co. Ltd., Watford, Herts. 5531

ELECTRICAL contractors in Central London area require estimating and supervising engineer with experience of good-class commercial and industrial installations. Apply in confidence stating age, experience and salary required.—Box 7702.

ELECTRICAL draughtsmen required for the Rugby drawing offices of the B.T.H. Co. Ltd. Accustomed to making schematic diagrams of electrical control schemes from engineers' drafts and preparing complete wiring diagrams. Apply in writing, giving details of age, experience, etc., to — Manager, Drawing Offices, British Thomson-Houston Co. Ltd., Rugby. 5660

ELECTRICAL engineer, aged 23/28, with leanings towards commercial work, required by well-known porcelain insulator manufacturers in the Midlands. The successful applicant would receive training in H.T. insulator design department and would be considered for subsequent transfer to technical sales. Starting salary £450 to £750 p.a. according to age and qualifications.—Box 5782.

ELECTRICAL engineer required to take charge of test and development laboratory. Applicant must have some years' experience in a laboratory concerned with any of the following: capacitors, insulation materials, cables. Position is progressive and offers excellent scope for keen engineer. Location London, E.17.—Box 5641.

ELECTRICAL engineers having experience in the design and manufacture of f.h.p. induction motors are required by progressive firm in Glasgow area: (a) Development engineers (two) of degree or H.N.C. standard; (b) Designer-draughtsmen (two) having good mechanical experience. Excellent opportunities to men of initiative and ability. Conditions include pension and life assurance scheme. Assistance will be given for suitable applicants requiring housing accommodation. Applications in strictest confidence. Apply giving details of age, experience, qualifications and salary to—Box 5698.

ELECTRICAL representative with existing connections in London area required by progressive firm of electrical contractors.—Maynards, 226, Southfield Road, London, W.4. 7699

ELECTRICAL research assistant. A large organisation in the North West wishes to appoint a young man to evaluate the electrical properties of new insulation products. Possession of Higher National Certificate in Electrical Engineering is desirable.—Box 5699.

ELECTRICIAN able work on own for old-established London contractor, permanency right man.—Phone. Temple Bar 2708. 5583

ELECTRICIANS and mates required by London contractors. Write giving short details of experience.—Box 7703.

ENGINEER, aged 25 to 35, preferably having Higher National Certificate, required for the maintenance of electronic equipment and the testing and alignment of new instruments used for quality control and automatic testing of all types of telecommunication cables. Apply giving full particulars to—Box 5741.

ELECTRICAL wholesalers require pricing clerk, also order clerk. Previous experience desirable. Gd. salary and pension.—London Electrical Co., 92, Blackfriars Road, London, S.E.1. 5658

ELECTRO-mechanical draughtsmen, senior and junior, required for the British Thomson-Houston Co.'s electronics drawing offices at Rugby and Leicester. Apply in writing, giving details of age, experience, etc., to — Manager, Drawing Offices, British Thomson-Houston Co. Ltd., Rugby. 5661

FOREMAN electrician required for developing lead-zinc property in Southern Nigeria. Successful applicant will be required to work on own on the initial pilot installation and must possess sound knowledge of power generation, underground cable jointing and industrial electrical plant as generally applied to the mining industry. Basic commencing salary £80 per month plus £12 10s. per month cost-of-living allowance; 10% provident fund; family passages paid after qualifying period. Tour overseas fifteen months followed by three months' paid leave. Original references should not be enclosed with application. Applicants will be interviewed during December. Successful applicant will be required to fly to Nigeria to take up his appointment during January, 1955. Write—Box 62, Walter Skinner Ltd., 20, Copthall Ave., London, E.C.2. 5783

FOREMAN supervisor experienced overhead transmission lines and cable work for contractors working Midlands and Southern England. Possibility of transfer abroad later. Write details age, experience.—Box 5409.

INSTRUMENT manufacturers in Harlow New Town Essex, have a vacancy for a tester with relays and process timers experience. Housing accommodation available.—Box 5727.

INVOICE clerk. Knowledge wholesale electrical trade. Good wages, permanent position.—Bennett & Fountain Ltd., 122, Great Titchfield Street, London, W.1. 5808

JOINTERS and electricians and mates required London power station contract, including Saturday and Sunday working. (Wat. 5891). 5707

JUNIOR draughtsman for contractors' office. Interesting work. State age and experience.—Box 5725.

LARGE European controlled company in Ceylon require assistant electrical engineer, age 20/30 years, preferably unmarried, sound knowledge of A.C. and D.C. distribution and work covered by general electrical contractors. Attractive terms to right man. Write—Box ZT.492, Deacon's Advertising, 36, Leadenhall Street, London, E.C.3. 5701

MAINTENANCE engineer (non-resident), experienced in maintenance repair work on electric lifts and motors. Central London area and district. 44-hour week. Reply giving experience to—Box 5760.

METROPOLITAN-VICKERS ELECTRICAL Co. Ltd., Trafford Park, Manchester, 17, have vacancies for servo engineers with some practical experience in electric servo and control circuit design and application. Qualifications required, a degree or Higher National Certificate. Applicants should not be less than 26 years of age. The posts are permanent and pensionable. Salary according to qualifications and experience. Apply in writing to the Personnel Manager, marking envelope "Servo Mechanisms." 215

OPENING for first-class supervisor/contracts manager for general contracting work. Only those with similar experience need apply. Give full details of experience and salary required. Replies will be treated in confidence. —Box 5743.

ORDER clerk, male, reqd. for correspondence and statistical work, by Tottenham eng. coy. Previous similar expce. essential. Write stating age, expce. and salary reqd. to—Box 5742

PRODUCTION development engineer required by electrical manufacturer engaged in mass production of small metal and plastic components. General experience in process and methods development with flair for experimental work are main qualifications. Location London, E.18.—Box 5585.

PUBLICITY manager required for old-established engineering company in London. Experience in the lighting industry would be an advantage. Pension scheme in force. State age, experience and salary required.—Box 5761.

PHILIPS ELECTRICAL Limited invite applications for the position as junior lighting engineer in the Birmingham area. Applicants should preferably be 23-28 years of age, educated to General School Certificate standard. Some knowledge of electrical matter and illuminating engineering an advantage. Must also be prepared to study to improve technical status. Progressive and permanent position. Please give full personal details and those relating to education, career to date, hobbies, etc., and whether driving licence holder, to—28, Ludgate, Hill, Birmingham, 3. 5744

PRICING clerks, order clerks, progress chasers required. Write giving full details experience to — Halsey's Electric Co. Ltd., 10, Lower Grosvenor Place, Victoria, London, S.W.1. 5745

QUALIFIED electrical engineer required for hydro-electric power undertaking in Northern Nigeria, 4,000 feet above sea level, pleasant climate. Comfortable furnished quarters provided, first class passages for self, wife and two children, or equivalent benefits if children remain at home. Good salary and pension scheme with liberal leave after 18 months' tour. Apply stating age, full qualifications and experience to—Box 1051, The E.C. Advertising Co., 54, Old Broad Street, London, E.C.2. 5762

REPRESENTATIVES calling on consulting engineers, factors and electrical contractors required on good commission basis for the sale of electric lighting fittings by well-known London manufacturers. Applications considered only from those with established connections. Salary and expenses after trial period. State full details and area covered.—Box 5606.

SALES engineer required for Lancashire headquarters of manufacturing company. Duties include preparation of and quoting for electric space heating schemes, visiting customers and dealing with correspondence. Write stating age, experience and salary required to —Box 7669.

SALES representative required for E.L.M.A. manufacturer for London area. Remuneration by salary, commission and expenses. Applications will be treated with strict confidence. State age and past experience to—Box 5746.

SALES representatives required by leading industrial heating equipment manufacturer. Good electrical and general engineering experience desirable. Ability to actually book orders essential. Territories London, Birmingham, Bristol, Cardiff, Southampton, Derby and Reading.—Box 5763.

SENIOR electrical design draughtsman experienced in the layout of power, lighting and instrument installations for work on oil refineries and chemical plants. Applicants should have completed a recognised engineering apprenticeship and possess H.N.C. or O.N.C. Experience in flameproof installations an advantage. Salary above average; 5-day week. Generous pension scheme. Address full details career to — Head Wrightson Processes Ltd., 24/26, Baltic Street, London, E.C.1. 5627

SENIOR electrical engineer or physicist required by large electrical manufacturer to develop the design of low-voltage electrical systems for domestic and industrial use, including components and fittings. This is a senior position calling for enterprise and initiative with a background of suitable experience and offering a correspondingly high salary. Replies will be treated in strict confidence.—Box 5645.

SENIOR mechanical designer, age 35-40, required with experience of mechanical design of medium and large-sized rotating electrical machines. Selected applicant will be offered good salary commensurate with experience and will be eligible for first-class non-contributory pension scheme.—Box 5784.

STEAM plant superintendent wanted for Canadian-owned 12,500-kW public utility in Georgetown, British Guiana. Age 30-40, preferably married. Good experience with oil-fired boilers and steam turbines essential. Good salary. First class passages; three months' leave at end of three-year period, and interim local leave; house with electric cooker and refrigerator provided at nominal rental; present superintendent being transferred to larger property. Applications with brief qualifications in writing only to—Messrs. Mackness & Shipley, Parliament Mansions, Abbey Orchard St., London, S.W.1, who will provide full particulars. 5657

STEEL erectors for contractors engaged steel tower line, Midlands area.—Box 5410.

STORES man with good knowledge wholesale elect. trade. Permanent job.—Bennett & Fountain Ltd., 122, Great Titchfield Street, London, W.1. 5807

TECHNICAL assistant required for electrical test and development laboratory. Suitable for man 20-25 who is progressing towards O.N.C. or H.N.C. Location London, E.18. Particulars to—Box 5809.

TECHNICAL assistant required for the testing of high-frequency and land communication cables. Previous experience preferred, but training given to suitable applicant. O.N.C. standard in electrical engineering would be an advantage. Salary in accordance with qualifications and experience. Five-day week and pension scheme. Details to—The Personnel Manager, Telcon Works, Greenwich, London, S.E.10. 5764

TECHNICAL service engineer required by leading electric cooker manufacturer for an area approximating to the South Wales and South Western Electricity Boards. Residence in the Bristol area will, therefore, be necessary. The successful applicant should have a thorough knowledge of electric cookers, and, whilst the position will entail some manual work, in general it will involve calling at repair depots with information and guidance. The position might offer to a suitable person the possibility of promotion to technical representative at a later date. State present salary and give full details to—Box 3042, c/o 117, Piccadilly, London, W.1. 5728

THE "ELECTRICAL REVIEW" has a vacancy for a qualified technical editorial assistant, age about 30; university graduate and/or corporate member of I.E.E. Should have had manufacturing or electricity supply experience and be able to write. Superannuation scheme. Applications, which will be treated in strict confidence, should be sent to—The Managing Editor, "Electrical Review," Dorset House, Stamford Street, London, S.E.1. 7670

TIME study and rate fixing engineer required by electric lamp manufacturers. Applicants must have had experience in this type of work on small electrical components and/or assembly. Salary according to qualifications and experience. Apply in confidence to—K.X. Lamps Limited, East Middlesbrough Industrial Estate, Southbank Road, Middlesbrough, Yorks. 5729

TRANSFORMER designer required for transformers and chokes up to 25 kVA. Good opportunity for right man. Write stating experience and salary required.—Pearce Transformer Co. Ltd., New Cross, London, S.E.14.

TRANSFORMER draughtsmen required, fully experienced up to 2,000 kVA, 66 kV; 5-day week, pension scheme. Apply to Chief Mechanical Engineer, Hackbridge and Hewittic Electric Co. Ltd., Walton-on-Thames, Surrey, giving details of experience and salary required. 5422

TRICITY COOKERS Ltd. require a service engineer to operate from Leeds. Applicants should have thorough knowledge of domestic electric cookers and be prepared to attend the company's factory for detailed instruction in their products. A service van will be provided and applicants should reside in the Leeds area. Entrance to pension and life assurance fund. Apply in writing giving full details of experience and salary required to—Works Manager, Tricity Cookers Ltd., Parsonage Lane, Enfield, Middx. 5779

WELL-known electrical manufacturing company has a vacancy for a sales engineer for electrical rotating machinery in Sheffield. Successful applicant must be a trained electrical engineer with O.N.C. as a minimum qualification and with previous sales experience in the area covered. He will work from the company's existing branch office. Remuneration by salary and expenses. Non-contributory pension scheme. Apply—Box 5730.

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Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

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CHIEF draughtsman, 22 yrs.' exp. light electrical equipment, age 43. Present location N. London. D.O. position not essential, commercial post considered.—Box 7695.

ADVERTISER with thirty years' varied experience electrical installation and appliances, desiring change, seeks responsible position as manager, assistant manager or London representative.—Box 7698.

A.M.I.E.E. (40) seeks fresh senior position of considerable responsibility. Excellent education and pleasing personality. Control mechanisms, switchgear, also specialised lighting. Design, manufacture, sales and administration. Preference for medium-size firm in London. Willing to travel. A loyal hard worker who gives value and gets things done. —Box 7674.

CANADIAN, 27 yrs.' extensive practical experience and five years in administration, estimation and supervision with electrical contracting firms engaged in large commercial and industrial installation projects. London area preferred.—Box 7678.

CHARTERED electrical engineer requires agency/sales representative position, East Midlands, covering electric motors, switchgear and allied equipment. Established connections with industrial users and re-sellers in this area. —Box 7688.

ELECTRICAL engineer seeks appointment with established London contractor as manager/engineer, adaptable personality, loyal and conscientious, wide experience, design of schemes, estimating and supervision to final invoicing, correspondence, etc.—Box 7685.

ELECTRICAL engineer (28), H.N.C., 5 yrs. B.T.H. engineering apprentice, 6 yrs.' testing and medium power layout design experience, desires post with established firm in South London.—Box 7693.

ELECTRICIAN seeks any work overseas.—Box 7694.

ELECTRICIAN-fitter, wide experience all kinds mechanical-electrical machinery, apparatus, etc., installation, repair, service work, good refs.; willing to travel.—Box 7697.

ESTIMATOR and supervisor, A.M.A.S.E.E., 30 years' experience contracting and maintenance, seeks progressive position with consultant, contractor or manufacturer.—Box 7680.

INSTALLATION engineer (43), wide experience at home and overseas. Supervision, planning and complete handling of large industrial and general contracts. Full details on request. London area or abroad.—Box 7704.

PRACTICAL electrical engineer, with adequate technical background, 36 years' varied experience covering design, manufacture and repair of small and medium equipment and motors and contracting, 25 years' charge experience. Seeking responsible position in Southern England.—Box 7677.

SUPERVISING engineer, M.A.S.E.E., fully experienced, seeks responsible post, any area. Preference for managership local company.—Box 7690.

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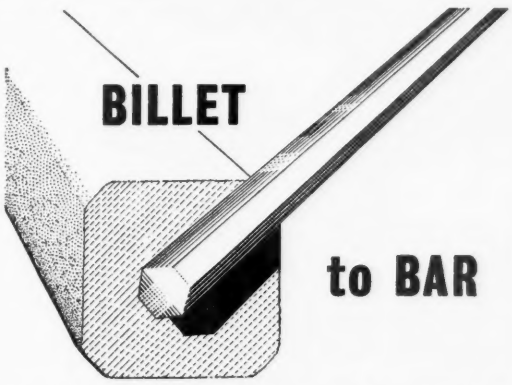

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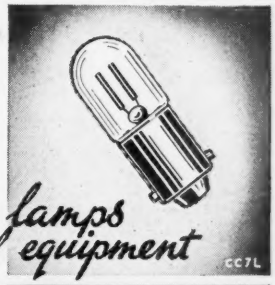

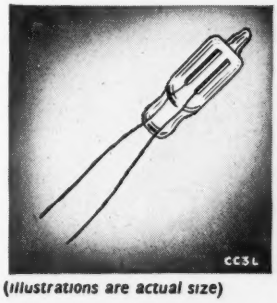

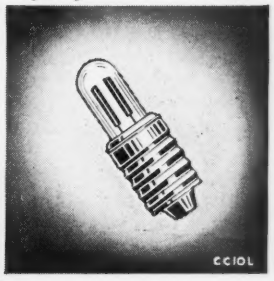

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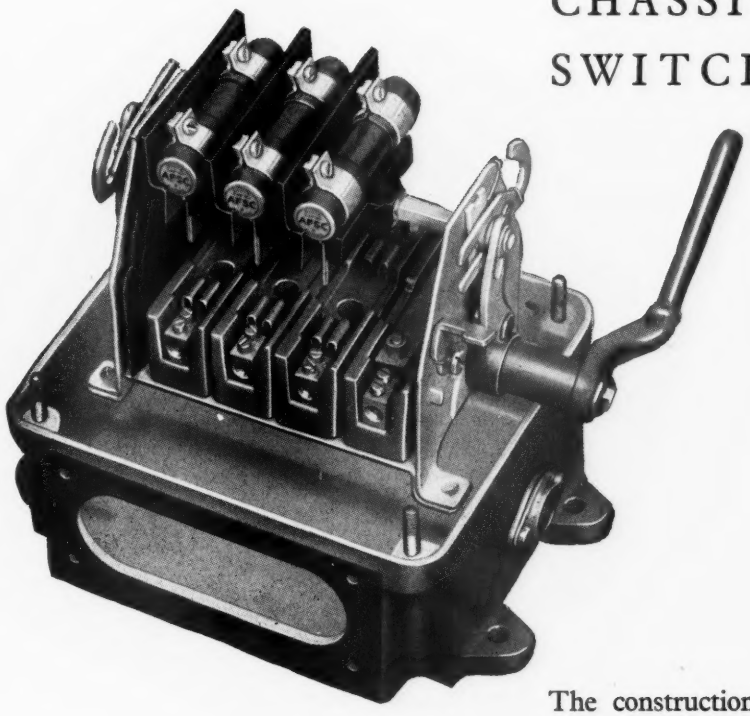

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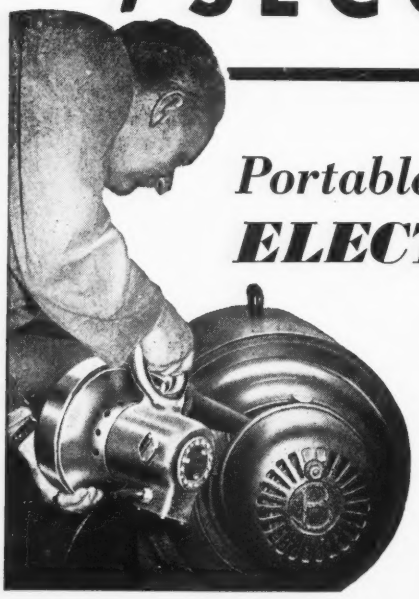

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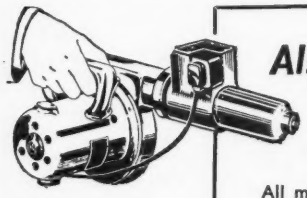

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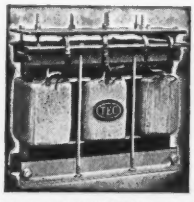

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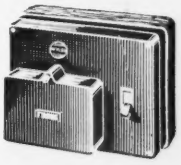

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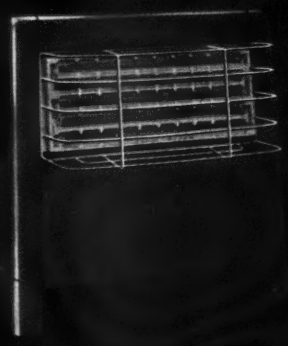

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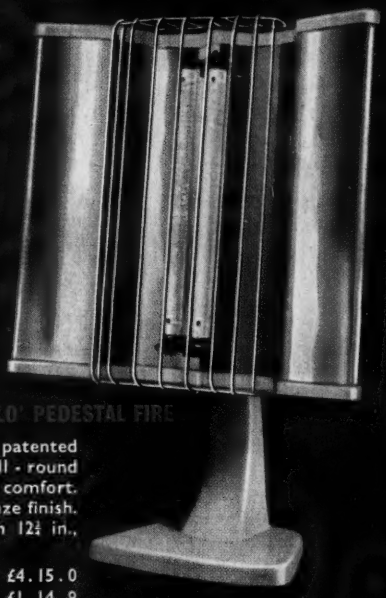

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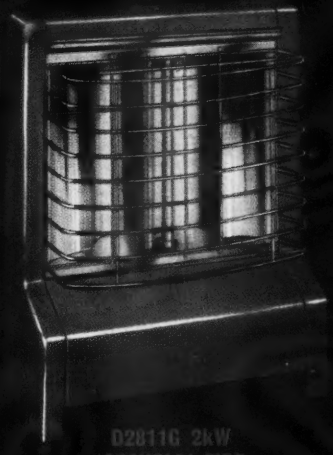

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